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                  EMPFIT: A COMPUTER CODE FOR FITTING EMP WAVEFORMS THAT FACILITA--ETC(U)
                  SEP 78   J M CLODFELTER   MIPR-6-531
UNCLASSIFIED   HDL-TR-1801-S   NL

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This report is a supplement to the original report (HDL-TR-1801) on the computer code EMPFIT and reflects the changeover from a CDC 6600 computer to an IBM 370/168 computer. Also, some additional modifications have been added to increase the usefulness and versatility of the code. EMPFIT is a code that is useful in fitting an electromagnetic pulse, as well as other data, with a simple function that is easily differentiated and Fourier ——→ next page

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transformed. This report deals only with the aspects necessary to the conversion to the IBM system and also with the new modifications. Material not mentioned in this supplement remains unaffected.

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CONTENTS

APPENDICES

FIGURES

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1. INTRODUCTION

The computer code EMPFIT provides a method for fitting an electromagnetic pulse (EMP), as well as other traces, with a simple function that is easily differentiated and Fourier transformed. This report is a supplement to the original report on EMPFIT and reflects the changeover from a Control Data Corp. (CDC) 6600 computer at the Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA, to the IBM 370/168 computer at the Harry Diamond Laboratories (HDL), Adelphi, MD. Along with this conversion effort, several modifications have been added, making EMPFIT more useful and versatile.

In the following sections, a description of the time derivative calculations and options detailing read and write selections on a disk file of EMPFIT will be given. Next, a section on increasing the accuracy of the code using the AUTODBL option of the IBM 370/168 is explained. Also, a time cutoff modification will be detailed and a full listing of all of the output options is included. A brief description of the new subroutines added to EMPFIT is discussed and an up-to-date section on preparing input cards to run the code is also presented. Finally, a section on the job control language (JCL) necessary to run EMPFIT at the Woodbridge Research Facility (WRF) is given. In appendices A and B, a listing and sample run of EMPFIT along with examples of input data appear.

2. DERIVATIVE OF FITTING FUNCTION

Following the theory of EMPFIT,[1] we fit the data points (t_i, f_i) for $1 \le i \le N$ using the function

$$
f(t) = \begin{cases}
A_1 e^{\alpha t} + A_3 e^{2\alpha t} , & \text{for } t \le t_1 , \quad (1) \\[2ex]
\dfrac{f_{i+1}(t - t_i) + f_i(t_{i+1} - t)}{t_{i+1} - t_i} + \dfrac{1}{2}\left(B_i + B_{i+1}\right)\left(t - t_i\right)\left(t - t_{i+1}\right) \\[2ex]
\quad + C_i\left(t - t_i\right)\left(t_{i+1} - t\right)^3 + D_{i+1}\left(t_{i+1} - t\right)\left(t - t_i\right)^3 , \quad (2) \\[2ex]
\qquad\qquad\qquad\qquad \text{for } t_i \le t \le t_{i+1} , \\[2ex]
A_2 e^{-\beta t} + A_4 e^{-2\beta t} , & \text{for } t \ge t_N . \quad (3)
\end{cases}
$$

---

[1]*Thomas V. Noon, User's Manual for the Modular Analysis-Package Libraries ANAPAC and TRANL, Harry Diamond Laboratories TR-1782-S (September 1977).*

5

The derivative is then easily calculated as

$$
f(t) = \begin{cases}
\alpha\Big[f(t) + A_3 e^{2\alpha t}\Big] , & \text{for } t \le t_1 , \quad (4) \\[2ex]
\dfrac{f_{i+1} - f_i}{t_{i+1} - t_i} + \dfrac{1}{2}\big(B_i + B_{i+1}\big)\Big[\big(t - t_{i+1}\big) + \big(t - t_i\big)\Big] \\[2ex]
\quad + C_i\Big[\big(t_{i+1} - t\big)^3 - 3\big(t - t_i\big)\big(t_{i+1} - t\big)^2\Big] & (5) \\[2ex]
\quad + D_{i+1}\Big[-\big(t - t_i\big)^3 + 3\big(t_{i+1} - t\big)\big(t - t_i\big)^2\Big] , \\[2ex]
\hspace{4cm} \text{for } t_i \le t \le t_{i+1} , \\[2ex]
-\beta\Big[f(t) + A_4 e^{-2\beta t}\Big] , & \text{for } t \ge t_N . \quad (6)
\end{cases}
$$

Examples of plots of $f(t)$ and its derivative can be seen in figures 1 and 2.

MAGNETIC INDUCTION—AZIMUTHAL
LEMP PROBLEM 2
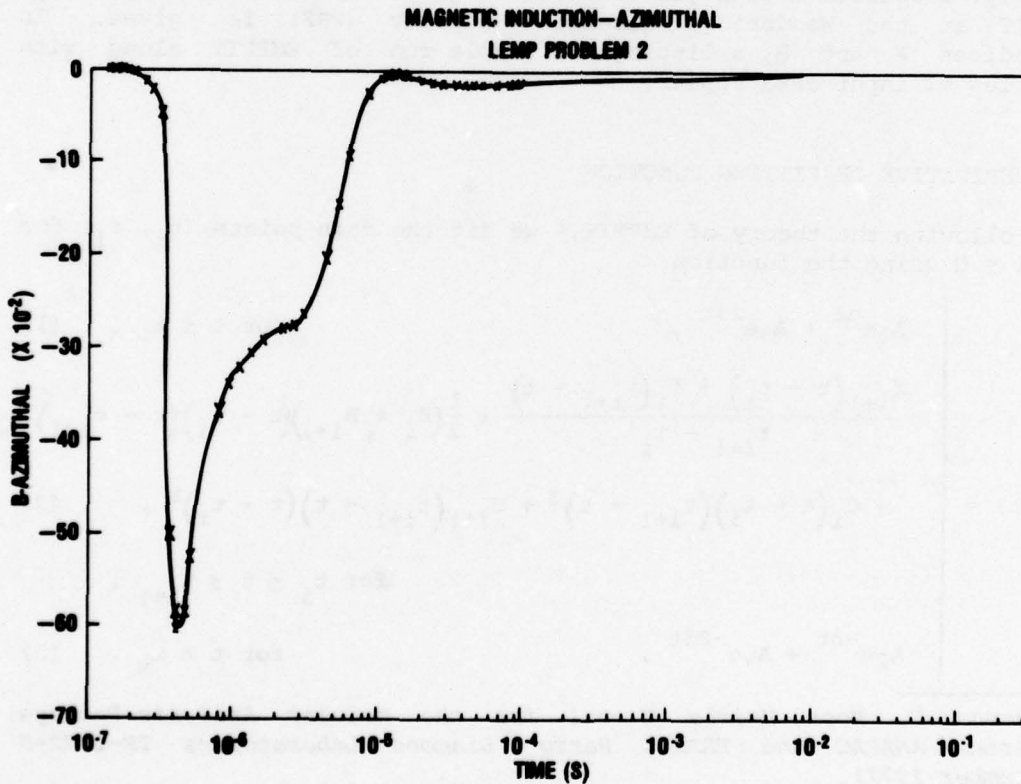
Figure 1. Curve fit, $f(t)$.

6
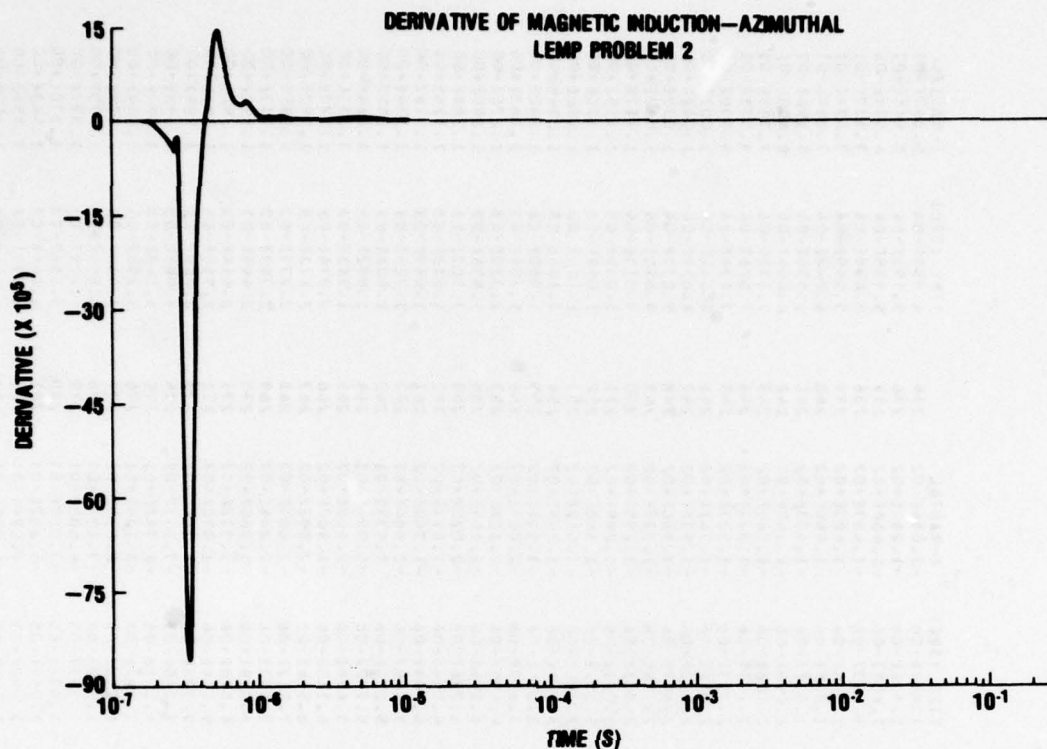
Figure 2.   Derivative of curve fit, f'(t).

3.   READ AND WRITE DISK FILE OPTIONS

Since there was an apparent need to be able to use data not in card format, the necessary modifications were made to utilize data that exist on a permanent disk file.   With these new changes, input data to EMPFIT can now be entered through a disk file and it is also possible to add or delete specified data pairs from this disk file data.   When the "read from a disk file" option is chosen, a numbered printout of the data from the disk file is produced (see fig. 3) and any deletions or additions are made in reference to this listing.   Deletions are accomplished by selecting the integer number of the time-amplitude point to be scratched and entering this value as described in section 8.   An example of the input cards necessary to delete data points appears in appendix B. Additions to the disk file data are entered by the time-amplitude value and are automatically placed in   the proper location.   The use of this option is also detailed in section 8, while an example of the input cards required to add data points can be found in appendix B.

7

Figure 3. Example of disk file printout.

ELECTRIC FIELD STRENGTH-RADIAL
NEMP PROBLEM A   OBSERVER 1

	TIME (SEC)	E-RADIAL
1	1.000E-08	0.0
2	1.000E-08	2.154E-12
3	1.038E-08	1.055E+00
4	1.269E-08	9.021E+00
5	1.481E-08	2.977E+01
6	1.705E-08	6.791E+01
7	1.948E-08	1.255E+02
8	2.191E-08	1.911E+02
9	2.406E-08	2.479E+02
10	2.656E-08	3.032E+02
11	2.843E-08	3.393E+02
12	3.043E-08	3.796E+02
13	3.133E-08	4.011E+02
14	3.214E-08	4.239E+02
15	3.287E-08	4.476E+02
16	3.353E-08	4.723E+02
17	3.412E-08	4.976E+02
18	3.465E-08	5.238E+02
19	3.513E-08	5.499E+02
20	3.556E-08	5.755E+02
21	3.595E-08	6.004E+02
22	3.630E-08	6.242E+02
23	3.661E-08	6.465E+02
24	3.689E-08	6.673E+02
25	3.715E-08	6.863E+02
26	3.737E-08	7.037E+02
27	3.758E-08	7.196E+02
28	3.778E-08	7.350E+02
29	3.818E-08	7.656E+02
30	3.858E-08	7.957E+02
31	3.898E-08	8.249E+02
32	3.938E-08	8.533E+02
33	3.998E-08	8.946E+02
34	4.039E-08	9.216E+02
35	4.189E-08	1.010E+03
36	4.316E-08	1.067E+03
37	4.515E-08	1.134E+03
38	4.659E-08	1.176E+03
39	4.827E-08	1.219E+03
40	5.020E-08	1.261E+03
41	5.245E-08	1.301E+03
42	5.413E-08	1.329E+03
43	5.599E-08	1.374E+03
44	5.804E-08	1.413E+03
45	6.031E-08	1.561E+03
46	6.280E-08	1.474E+03
47	6.555E-08	1.689E+03
48	6.858E-08	1.839E+03
49	7.192E-08	1.927E+03
50	7.372E-08	2.008E+03

	TIME (SEC)	E-RADIAL
118	1.461E-06	-1.096E+02
119	1.526E-06	-1.292E+02
120	1.608E-06	-1.438E+02
121	1.673E-06	-1.487E+02
122	1.756E-06	-1.485E+02
123	1.836E-06	-1.450E+02
124	1.921E-06	-1.403E+02
125	2.020E-06	-1.348E+02
126	2.102E-06	-1.324E+02
127	2.201E-06	-1.322E+02
128	2.317E-06	-1.337E+02
129	2.416E-06	-1.361E+02
130	2.531E-06	-1.378E+02
131	2.647E-06	-1.366E+02
132	2.779E-06	-1.331E+02
133	2.911E-06	-1.295E+02
134	3.043E-06	-1.289E+02
135	3.192E-06	-1.360E+02
136	3.340E-06	-1.512E+02
137	3.489E-06	-1.706E+02
138	3.654E-06	-1.916E+02
139	3.819E-06	-2.059E+02
140	4.000E-06	-2.116E+02
141	4.198E-06	-2.104E+02
142	4.396E-06	-2.025E+02
143	4.594E-06	-1.811E+02
144	4.809E-06	-1.340E+02
145	5.040E-06	-5.880E+01
146	5.271E-06	1.477E+01
147	5.272E-06	-5.934E+01
148	5.698E-06	-2.008E+02
149	6.115E-06	-1.968E+02
150	6.566E-06	-2.892E+02
151	7.052E-06	-2.407E+02
152	7.537E-06	-2.294E+02
153	8.058E-06	-1.866E+02
154	8.578E-06	-1.372E+02
155	9.134E-06	-1.070E+02
156	9.723E-06	-8.248E+01
157	1.035E-05	-7.351E+01
158	1.101E-05	-8.732E+01
159	1.167E-05	-8.124E+01
160	1.240E-05	-6.684E+01
161	1.312E-05	-7.133E+01
162	1.392E-05	-6.603E+01
163	1.472E-05	-6.802E+01
164	1.559E-05	-6.802E+01
165	1.646E-05	-6.029E+01
166	1.739E-05	-5.069E+01
167	1.840E-05	-4.333E+01

	TIME (SEC)	E-RADIAL
235	4.959E-04	5.887E-01
236	5.193E-04	5.945E-01
237	5.435E-04	6.559E-01
238	5.698E-04	7.137E-01
239	5.959E-04	7.679E-01
240	6.242E-04	7.689E-01
241	6.536E-04	8.196E-01
242	6.855E-04	8.680E-01
243	7.172E-04	9.139E-01
244	7.516E-04	9.571E-01
245	7.874E-04	9.592E-01
246	8.246E-04	1.001E+00
247	8.634E-04	1.041E+00
248	9.037E-04	1.077E+00
249	9.475E-04	1.082E+00
250	9.913E-04	1.117E+00
251	1.039E-03	1.150E+00
252	1.088E-03	1.180E+00
253	1.140E-03	1.186E+00
254	1.194E-03	1.214E+00
255	1.250E-03	1.240E+00
256	1.309E-03	1.263E+00
257	1.370E-03	1.270E+00
258	1.436E-03	1.290E+00
259	1.502E-03	1.308E+00
260	1.573E-03	1.324E+00
261	1.649E-03	1.338E+00
262	1.725E-03	1.344E+00
263	1.808E-03	1.355E+00
264	1.892E-03	1.364E+00
265	1.983E-03	1.371E+00
266	2.074E-03	1.377E+00
267	2.173E-03	1.382E+00
268	2.277E-03	1.385E+00
269	2.383E-03	1.387E+00
270	2.495E-03	1.392E+00
271	2.614E-03	1.392E+00
272	2.735E-03	1.391E+00
273	2.864E-03	1.388E+00
274	3.001E-03	1.393E+00
275	3.143E-03	1.389E+00
276	3.290E-03	1.384E+00
277	3.445E-03	1.379E+00
278	3.609E-03	1.373E+00
279	3.779E-03	1.377E+00
280	3.956E-03	1.370E+00
281	4.144E-03	1.363E+00
282	4.339E-03	1.356E+00
283	4.544E-03	1.359E+00
284	4.757E-03	1.352E+00

Figure 3. Example of disk file printout (cont'd).

Index	Col A	Col B
51	7.759E-08	2.153E+03
52	7.967E-08	2.205E+03
53	8.414E-08	2.359E+03
54	8.644E-08	2.400E+03
55	9.104E-08	2.395E+03
56	9.334E-08	2.458E+03
57	9.794E-08	2.623E+03
58	1.025E-07	2.604E+03
59	1.071E-07	2.653E+03
60	1.117E-07	2.704E+03
61	1.163E-07	2.702E+03
62	1.212E-07	2.732E+03
63	1.263E-07	2.751E+03
64	1.315E-07	2.749E+03
65	1.372E-07	2.751E+03
66	1.430E-07	2.749E+03
67	1.491E-07	2.759E+03
68	1.555E-07	2.740E+03
69	1.622E-07	2.724E+03
70	1.692E-07	2.690E+03
71	1.766E-07	2.655E+03
72	1.843E-07	2.620E+03
73	1.924E-07	2.583E+03
74	2.050E-07	2.518E+03
75	2.138E-07	2.468E+03
76	2.231E-07	2.416E+03
77	2.330E-07	2.360E+03
78	2.431E-07	2.303E+03
79	2.538E-07	2.245E+03
80	2.651E-07	2.186E+03
81	2.769E-07	2.126E+03
82	2.891E-07	2.067E+03
83	3.022E-07	2.006E+03
84	3.156E-07	1.947E+03
85	3.298E-07	1.888E+03
86	3.442E-07	1.831E+03
87	3.594E-07	1.774E+03
88	3.745E-07	1.720E+03
89	3.987E-07	1.640E+03
90	4.150E-07	1.590E+03
91	4.316E-07	1.541E+03
92	4.491E-07	1.491E+03
93	4.752E-07	1.426E+03
94	4.926E-07	1.375E+03
95	5.205E-07	1.304E+03
96	5.392E-07	1.258E+03
97	5.677E-07	1.190E+03
98	5.877E-07	1.143E+03
99	6.178E-07	1.074E+03
100	6.484E-07	1.005E+03
101	6.807E-07	9.343E+02
102	7.129E-07	8.653E+02
103	7.457E-07	7.970E+02
104	7.803E-07	7.268E+02
105	8.149E-07	6.586E+02
106	8.503E-07	5.917E+02
107	8.872E-07	5.233E+02
108	9.244E-07	4.576E+02
109	9.745E-07	3.738E+02
110	1.014E-06	3.111E+02

Index	Col A	Col B
168	1.940E-05	-4.064E+01
169	2.048E-05	-3.962E+01
170	2.159E-05	-3.966E+01
171	2.277E-05	-3.859E+01
172	2.402E-05	-3.551E+01
173	2.530E-05	-3.206E+01
174	2.666E-05	-2.865E+01
175	2.808E-05	-2.700E+01
176	2.954E-05	-2.417E+01
177	3.110E-05	-2.067E+01
178	3.273E-05	-2.067E+01
179	3.443E-05	-2.281E+01
180	3.620E-05	-2.101E+01
181	3.807E-05	-1.727E+01
182	4.002E-05	-1.507E+01
183	4.206E-05	-1.427E+01
184	4.422E-05	-1.333E+01
185	4.647E-05	-1.414E+01
186	4.880E-05	-1.196E+01
187	5.126E-05	-9.675E+00
188	5.383E-05	-1.071E+01
189	5.653E-05	-1.072E+01
190	5.938E-05	-9.779E+00
191	6.233E-05	-7.894E+00
192	6.542E-05	-8.788E+00
193	6.865E-05	-7.764E+00
194	7.205E-05	-7.100E+00
195	7.562E-05	-6.539E+00
196	7.933E-05	-6.533E+00
197	8.322E-05	-5.613E+00
198	8.731E-05	-5.519E+00
199	9.158E-05	-5.141E+00
200	9.606E-05	-4.949E+00
201	1.007E-04	-4.508E+00
202	1.057E-04	-4.094E+00
203	1.108E-04	-4.479E+00
204	1.162E-04	-9.442E+01
205	1.218E-04	-3.623E+00
206	1.277E-04	-3.594E+00
207	1.339E-04	-3.071E+00
208	1.403E-04	-2.922E+00
209	1.472E-04	-2.587E+00
210	1.542E-04	-2.265E+00
211	1.616E-04	-2.116E+00
212	1.695E-04	-1.884E+00
213	1.776E-04	-1.672E+00
214	1.861E-04	-1.452E+00
215	1.950E-04	-1.357E+00
216	2.044E-04	-1.182E+00
217	2.141E-04	-1.018E+00
218	2.244E-04	-8.523E-01
219	2.351E-04	-7.839E-01
220	2.464E-04	-6.434E-01
221	2.581E-04	-5.092E-01
222	2.705E-04	-3.832E-01
223	2.834E-04	-2.673E-01
224	2.969E-04	-2.313E-01
225	3.111E-04	-1.254E-01
226	3.259E-04	-2.603E-02
227	3.414E-04	6.736E-02

Index	Col A	Col B
285	4.982E-03	1.344E+00
286	5.215E-03	1.337E+00
287	5.461E-03	1.340E+00
288	5.720E-03	1.332E+00
289	5.989E-03	1.325E+00
290	6.273E-03	1.317E+00
291	6.568E-03	1.319E+00
292	6.876E-03	1.312E+00
293	7.202E-03	1.304E+00
294	7.541E-03	1.297E+00
295	7.895E-03	1.291E+00
296	8.270E-03	1.284E+00
297	8.658E-03	1.276E+00
298	9.065E-03	1.267E+00
299	9.495E-03	1.262E+00
300	9.941E-03	1.273E+00
301	1.041E-02	1.257E+00
302	1.090E-02	1.252E+00
303	1.141E-02	1.246E+00
304	1.196E-02	1.244E+00
305	1.252E-02	1.244E+00
306	1.310E-02	1.240E+00
307	1.373E-02	1.237E+00
308	1.437E-02	1.233E+00
309	1.505E-02	1.233E+00
310	1.576E-02	1.230E+00
311	1.650E-02	1.227E+00
312	1.728E-02	1.225E+00
313	1.809E-02	1.222E+00
314	1.894E-02	1.222E+00
315	1.984E-02	1.228E+00
316	2.078E-02	1.216E+00
317	2.175E-02	1.216E+00
318	2.278E-02	1.216E+00
319	2.385E-02	1.214E+00
320	2.497E-02	1.212E+00
321	2.616E-02	1.211E+00
322	2.739E-02	1.211E+00
323	2.867E-02	1.209E+00
324	3.003E-02	1.208E+00
325	3.144E-02	1.207E+00
326	3.293E-02	1.207E+00
327	3.448E-02	1.205E+00
328	3.610E-02	1.203E+00
329	3.781E-02	1.203E+00
330	3.959E-02	1.203E+00
331	4.145E-02	1.201E+00
332	4.341E-02	1.202E+00
333	4.545E-02	1.201E+00
334	4.759E-02	1.200E+00
335	4.985E-02	1.200E+00
336	5.219E-02	1.201E+00
337	5.466E-02	1.200E+00
338	5.723E-02	1.200E+00
339	5.992E-02	1.700E+00
340	6.276E-02	1.199E+00
341	6.571E-02	1.199E+00
342	6.879E-02	1.199E+00
343	7.205E-02	1.198E+00
344	7.544E-02	1.198E+00

Figure 3. Example of disk file printout (cont'd).

111	1.067E-06	2.333E+02	228	3.577E-04	8.558E-02	345	7.898E-02	1.197E+00
112	1.121E-06	1.621E+02	229	3.746E-04	1.715E-01	346	8.273E-02	1.197E+00
113	1.164E-06	1.110E+02	230	3.925E-04	2.533E-01	347	8.661E-02	1.197E+00
114	1.221E-06	5.035E+01	231	4.116E-04	3.450E-01	348	9.068E-02	1.197E+00
115	1.278E-06	-1.371E+00	232	4.308E-04	3.680E-01	349	9.498E-02	1.296E+00
116	1.339E-06	-4.635E+01	233	4.517E-04	4.485E-01	350	9.944E-02	1.296E+00
117	1.400E-06	-8.244E+01	234	4.734E-04	5.214E-01	351	1.000E-01	1.196E+00

10

In addition to being able to read input data from a permanent file, it is now possible to write specific output to a permanent disk file so that other computer codes may use EMPFIT's calculations. Thus, EMPFIT is now set up to write the calculations of the derivative, f'(t), on a disk file at either the input data points or the curve fit data pairs. Also, the calculations for the curve fit, f(t), may be written on a permanent file. The utilization of these permanent file disk writes, which are performed on separate devices, is fully described in section 8.

It should be noted that it is possible in EMPFIT to read and write data from or to a disk file in any particular format. The subroutines READPF and WRITPF are used by EMPFIT to perform the disk file read and write operations, respectively, and may be changed to fit the user's need. Figures 4 and 5 show the listings of READPF and WRITPF and the starred (*) cards reflect cards that may be changed according to a particular user's requirements. To employ these user modifications requires the user's version of READPF and WRITPF to be placed behind the //FORT.SYSIN DD * card seen in section 9.

```
      SUBROUTINE READPF(NT,NSETS,X,Y,JPTS)
      DIMENSION X(JPTS),Y(JPTS)
      DO 10 J=1,NSETS
      READ (NT) N1,N2,JPTS,(X(I),A,I=1,JPTS),(Y(I),B,I=1,JPTS)    *
10    CONTINUE
      RETURN
      END
```

Figure 4. Listing of subroutine READPF.

```
      SUBROUTINE WRITPF(NT,X,Y,NPTS,ATITLE)
      DIMENSION X(NPTS),Y(NPTS),ATITLE(10)
      WRITE(NT) ATITLE          *
      WRITE(NT) NPTS            *
      WRITE(NT) X,Y             *
      RETURN
      END
```

Figure 5. Listing of subroutine WRITPF.

11

4. DOUBLE PRECISION AND EXPONENTIAL CALCULATIONS

The IBM version of EMPFIT has been written in such a manner that the AUTODBL option of the HDL IBM 370/168 can be used and not affect the plotting software. This variation is seen in the subroutine ANOTAT which has been constructed differently from the CDC version to accommodate the AUTODBL option, which automatically converts all single and double precision variables to double and extended precision quantities, respectively. This conversion allows greater accuracy in the computations and is easy to employ. Only minor changes are required in EMPFIT, specifically dealing with the plotting software of ANAPAC.[1] In particular, the only modifications occur in calling the double precision versions of subroutine DRAW4, which appear in EMPFIT's plotting routine PLOTT. If the AUTODBL option is chosen, EMPFIT should be compiled with the following changes in subroutine PLOTT:

(1) The DRAW4 calls

```
CALL DRAW4(1,3,3,3,8,20, XTITLE, YTITLE, ATITLE, TITLE)
CALL DRAW4(2,3,ILNLOG, IPTS,-2,10,T,F,0.,0.)
CALL DRAW4(2,3,ILNLOG, MAXPTS, 0,10,TT,FF,0.,0.)
CALL DRAW4(3,3,0,0,0, MAXPTS, TT,FF,2.,0.)
```

should be changed to

```
CALL DRAW41(3,3,3,8,20, XTITLE, YTITLE, ATITLE, TITLE)
CALL DRAW42(3,ILNLOG, IPTS, -2,10,T,F,0.,0.)
CALL DRAW42(3, ILNLOG, MAXPTS, 0,10,TT,FF,0.,0.)
CALL DRAW43(3,0,0,0, MAXPTS, TT,FF,2.,0.)
```

(2) The DRAW4 calls

```
CALL DRAW4(1,3,3,3,8,20, XTITLE, YTITLE, ATITLE, TITLE)
CALL DRAW4(2,3, ILNLOG, MAXPTS, 0,10,TT,FF,0.,0.)
CALL DRAW4(3,3,0,0,0, MAXPTS, TT,FF,2.,0.)
```

should be changed to

```
CALL DRAW41(3,3,3,8,20, XTITLE, YTITLE, ATITLE, TITLE)
CALL DRAW42(3, ILNLOG, MAXPTS, 0,10,TT,FF,0.,0.)
CALL DRAW43(3,0,0,0, MAXPTS, TT,FF,2.,0.)
```

---

[1] *Thomas V. Noon, User's Manual for the Modular Analysis-Package Libraries ANAPAC and TRANL, Harry Diamond Laboratories TR-1782-S (September 1977).*

(3) The DRAW4 calls

```
CALL DRAW4(1,3,4,5,14,20, XTITLE, YTITLE, FTITLE, TITLE)
CALL DRAW4(2,3,2,OPTS, 0,10,OMEGA, ZABS, 0.,0.)
CALL DRAW4(3,3,0,0,0,OPTS,OMEGA,ZABS,2.,0.)
```

should be changed to

```
CALL DRAW41(3,4,5,14,20,XTITLE,YTITLE,FTITLE,TITLE)
CALL DRAW42(3,2,OPTS,0,10,OMEGA,ZABS,0.,0.)
CALL DRAW43(3,0,0,0,OPTS,OMEGA,ZABS,2.,0.)
```

(4) The DRAW4 calls

```
CALL DRAW4(1,3,3,3,12,20,XTITLE,YTITLE,FTITLE,TITLE)
CALL DRAW4(2,3,ILNLOG,MAXPTS,0,10,TT,DFF,0.,0.)
CALL DRAW4(3,3,0,0,0,MAXPTS,TT,DFF,2.,0.)
```

should be changed to

```
CALL DRAW41(3,3,3,12,20,XTITLE,YTITLE,FTITLE,TITLE)
CALL DRAW42(3,ILNLOG,MAXPTS,0,10,TT,DFF,0.,0.)
CALL DRAW43(3,0,0,0,MAXPTS,TT,DFF,2.,0.)
```

It should also be noted that a convention involving the exponential function calculations has been employed. This is due to the word size difference between the CDC 6600 computer, which has 60 bits per word, and the IBM 370/168 computer, which has only 32 bits per word. Since the CDC version of EMPFIT allows exponential arguments to be taken up to approximately 720, while the IBM exponential argument size is limited to approximately 174, a simple change was added. This change was mainly influenced by the fact that EMPFIT fits data primarily in the time frame of 1 to 5000 shakes (1 shake $\approx 10^{-8}$ s) and exponential values sometimes need to be calculated which exceed the IBM limit of 174. Thus, it was decided that the easiest solution was to limit the size of exponential values to 174 rather than to make extensive software changes to EMPFIT. This limitation is only used when fitting the exponential functions (eq 1 and 3) to the front and rear of the fitting function where the values for α and β in equations 1 and 3 are minimized so that the argument size does not exceed 174. When this convention is automatically employed, EMPFIT prints out the largest values that can be used for α and β and the message that this variation has been utilized.

5. TIME CUTOFF OPTION

Since it is sometimes necessary to deal with data with amplitudes very nearly zero (with respect to the peak amplitude) at the tail of a

13

waveform, an addition has been employed which allows the user to chop off the trace after a prescribed time value. This option allows one to ignore meaningless information at the end of a waveform which exists on a permanent disk file and cannot be deleted easily. An example of this option can be seen in figures 6 and 7. The use of this modification is detailed in section 8.
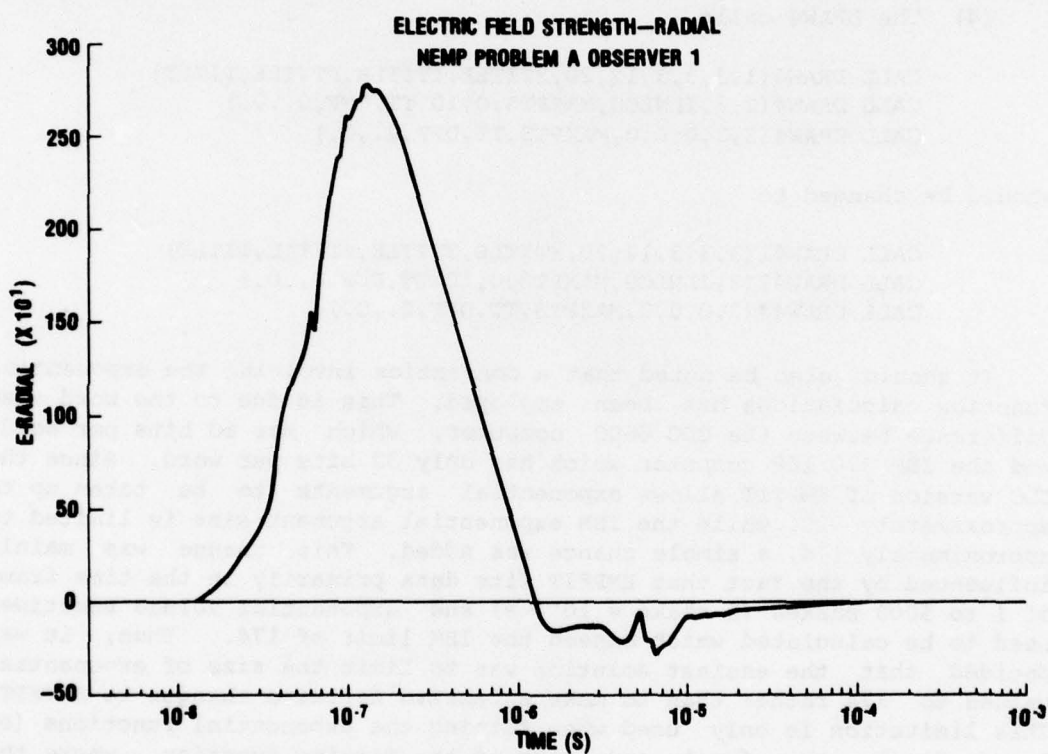
Figure 6. Example of curve with long, nearly zero tail.

14
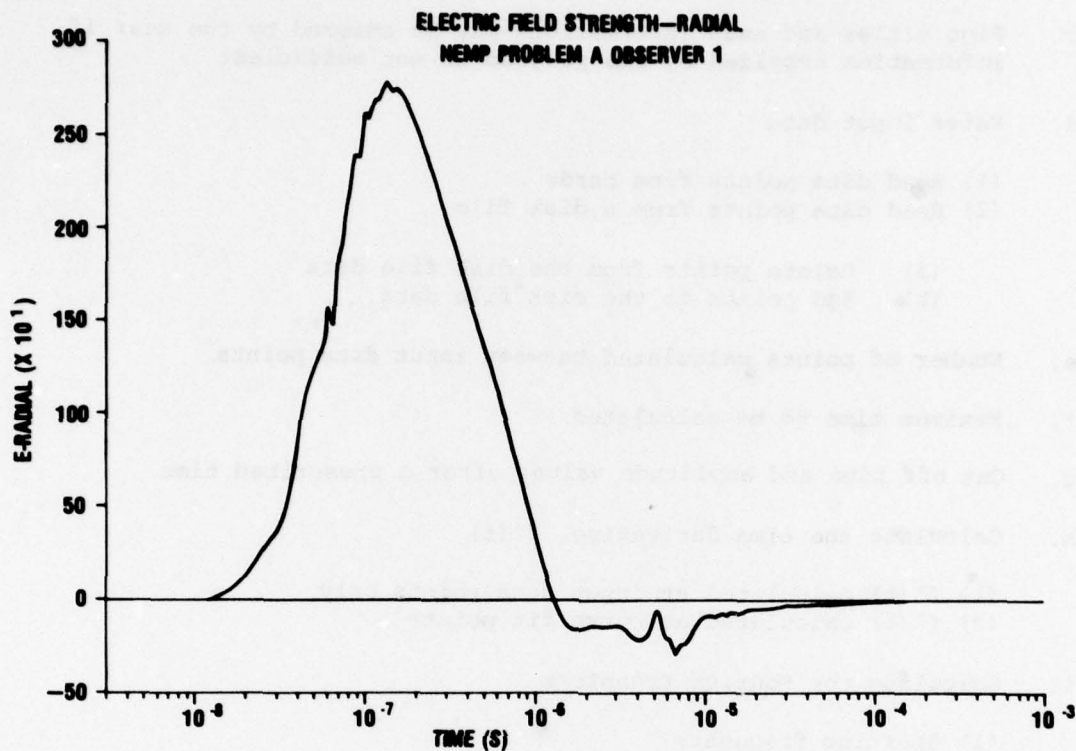
Figure 7. Example of time cutoff option applied to waveform
with long, nearly zero tail.

6. OUTPUT OPTIONS

With the aforementioned modifications EMPFIT now consists of
numerous output options. Thus a total compilation of these selections
will now be listed. The use of these options is fully detailed in
section 8.

a.   Multiple runs

b.   Plot titles and axes information supplied in program

(1) T vs E_R--time versus electric field strength--radial
(2) T vs E_V--time versus electric field strength--vertical
(3) T vs B_ϕ--time versus magnetic induction--azimuthal
(4) T vs J_R--time versus current density--radial
(5) T vs J_V--time versus current density--vertical
(6) T vs σ--time versus air conductivity

15

c. Plot titles and axes information--may be entered by the user if information supplied by the program is not sufficient

d. Enter input data

    (1) Read data points from cards
    (2) Read data points from a disk file

        (a) Delete points from the disk file data
        (b) Add points to the disk file data

e. Number of points calculated between input data points

f. Maximum time to be calculated

g. Cut off time and amplitude values after a prescribed time

h. Calculate the time derivative, $f'(t)$

    (1) $f'(t)$ calculated at input data points only
    (2) $f'(t)$ calculated at curve fit points

i. Calculate the Fourier transform

    (1) Starting frequency
    (2) Maximum frequency to be calculated

j. Plots

    (1) Linear
    (2) Log-log
    (3) Semilog   Available on curve fit and
                       derivative plots only;
        (a) Abscissa (log)   Fourier transform plots
        (b) Ordinate (linear) are always log-log

    (4) Minimum value of ordinate to be plotted (does not plot data points below this value)--useful when plotting linear or semilog and the range of values is very large

    (5) Curve fit plots--three plots may be obtained:

        (a) Data points (plotted with X's) and curve through data points
        (b) Curve only
        (c) Both (a) and (b)

16

(6) Derivative plot

(7) Fourier transform plot

k. Write data on a disk file

(1) Write the curve fit, f(t), on a disk file
(2) Write the time derivative, f'(t), on a disk file

7. DESCRIPTION OF NEW SUBROUTINES OF EMPFIT

The modified version of EMPFIT contains the following new subroutines.

PERFIL   Subroutine: reads the data from the disk file and writes
            the data points on output; deletes or adds any specified
            data points to the disk file data.

CUTOFF   Subroutine: cuts off the time and amplitude values after
            a prescribed time value.

DERIV   Subroutine: calculates the time derivative at either the
            input points or the curve fit points.

RITDAT   Subroutine: writes either or both the time derivative data
            and the curve fit data on a disk file.

READPF   Subroutine: reads input data from a disk file.

WRITPF   Subroutine: performs the actual writing of the data onto
            the disk file as specified by RITDAT.

8. DATA INPUT PREPARATION FOR EMPFIT (REVISION)

Input data cards for EMPFIT are prepared in the following manner.
Examples of input card decks appear in appendix B.

Column	Variable	Format	Explanation
Card 1: Multiple Run Card			
8-10	NRUN	I3	Number of runs

Column	Variable	Format	Explanation

Card 2: Plot Parameter Card

Column	Variable	Format	Explanation
10	IDENT	I1	Identifies data to be read in IDENT = 1 T vs E_R = 2 T vs E_V = 3 T vs B_ϕ = 4 T vs J_R = 5 T vs J_V = 6 T vs σ
20	IFFT	I1	Fourier transform? IFFT = 0 Yes = 1 No
30	IPLOT	I1	Plots? IPLOT = 0 Yes = 1 No
40	ILNLOG	I1	Plots in linear, log-log, or semilog? ILNLOG = 1 Linear = 2 Log-log = 3 Semilog Abscissa (log) Ordinate (linear)

Note: Fourier transform plots are always log-log.

Column	Variable	Format	Explanation
41-50	ORDMIN	E10.3	Minimum value of ordinate to be plotted (all points below this value are not plotted on linear or semilog plots)
60	ICURV	I1	Curve fit plots ICURV = 0 One plot of data points and curve fit = 1 One plot of curve fit only = 2 Two plots--one plot of data points and curve fit, one plot of curve fit only

Column	Variable	Format	Explanation
70	IOT	I1	Enter own plot and axes labels?
			IOT = 0 Use plot and axes labels supplied in program
			= 1 Enter own labels on cards 6, 7, 8
80	IREAD	I1	Read data points from permanent file?
			IREAD = 0 No = 1 Yes
			Calculate time derivative?
			IREAD = 0 No = 2 Yes
			Do both of above?
			IREAD = 0 No = 3 Yes

Card 3: Title Card

1-80	TITLE	8A10	Title or subtitle

Card 4: Fitting Parameter Card

8-10	IPTS	I3	Number of data points read in
18-20	MPTS	I3	Number of points calculated between input data points
21-30	TMAX	E10.3	Maximum time to be calculated in curve fit calculations
31-40	ALPHA	E10.3	Used to fit $f(t) = A_1 e^{\alpha t} + A_3 e^{2\alpha t}$ to front of waveform (good starting value: $\alpha = 1.2E+8$)

Column	Variable	Format	Explanation
41-50	BETA	E10.3	Used to fit $f(t) = A_2 e^{-\beta t} + A_4 e^{-2\beta t}$ to end of waveform (good starting value: $\beta = 5.0E+4$)
51-60	OSTART	E10.3	Frequency to start Fourier transform calculations
61-70	OMAX	E10.3	Maximum frequency to be calculated
80	ICUT	I1	Time cutoff?

ICUT = 0 No time cutoff
     = 1 Cutoff time points at pre-scribed time shown on card 5

Note: If IREAD = 0 Skip to card 13
            = 1 Skip to card 10
            = 2 Go to card 9
            = 3 Go to card 9

If IOT   = 1 Go to cards 6,7 8; then go to IREAD prescribed cards

If ICUT = 1 Go to card 5; then go to IREAD and IOT pre-scribed cards

Card 5: Time Cutoff Card

Column	Variable	Format	Explanation
1-10	TCUT	E10.3	Prescribed cutoff time value

Card 6: Abscissa Label Card

Column	Variable	Format	Explanation
1-10	XTITLE	A10	X label; start in column 1

20

Column	Variable	Format	Explanation
Card 7:	Ordinate Label Card		
1-20	YTITLE	2A10	Y label; start in column 1; on output, ordinate label is only in A10, A2 format instead of 2A10
Card 8:	Plot Label Card		
1-40	ATITLE	4A10	Plot label; start in column 1
Card 9:	Time Derivative Card		
10	IFPRIM	I1	IFPRIM = 1 f'(t) calculated at input data points only
			= 2 f'(t) calculated at input and calculated points
20	IPERM	I1	Write f'(t) on permanent file?
			IPERM = 0 No = 1 Yes (as specified by IFPRIM)
			Write f(t) on permanent file?
			IPERM = 0 No = 2 Yes
			Do both of above?
			IPERM = 0 No = 3 Yes
30	IFPPLT	I1	Plot of f'(t)?
			IFPPLT = 0 No = 1 Yes
			Note: If IREAD = 2 Skip to card 13 = 3 Go to card 10

Column	Variable	Format	Explanation

Card 10:   Permanent File Card

8-10	NSETS	I3	Number of particular data set to be read from disk file
8-20	IDELET	I3	Delete points from disk file data?
			IDELET = 0 No = 1 Yes
28-30	IADD	I3	Add points to disk file data?
			IADD = 0 No = 1 Yes

Note: If IDELET = 1 Go to card 11
        If IADD = 1 Go to card 12
        If IDELET & IADD = 1 Go to card 11,
                            then 12
        If IDELET & IADD = 0 Input for this
                            data run is
                            complete

Card 11:   Deletion Card

8-10	NUM	I3	Number of data point on
18-20	NUM	I3	disk file that is to be
28-30	NUM	I3	deleted from disk file data
38-40	NUM	I3	
48-50	NUM	I3	
58-60	NUM	I3	
68-70	NUM	I3	
78-80	NUM	I3	

Note: At present only eight data
pairs can be deleted.

Column	Variable	Format	Explanation
Card 12: Addition Card			
8-10	NIADD	I3	Number of data pairs to be added to disk file data
11-20	TX	E10.3	Time value of point 1 to be added
21-30	FY	E10.3	Amplitude value of point 1 to be added
31-40	TX	E10.3	Time value of point 2 to be added
41-50	FY	E10.3	Amplitude value of point 2 to be added
51-60	TX	E10.3	Time value of point 3 to be added
61-70	FY	E10.3	Amplitude value of point 3 to be added

Note: Additional cards may be entered starting in column 11. Data input is complete.

Column	Variable	Format	Explanation
Card 13: Data Card			
1-10	T	E10.3	Time value of first point
11-20	F	E10.3	Amplitude of first point
Card 14: Data Card			
1-10	T	E10.3	Time value of second point
11-20	F	E10.3	Amplitude of second point

Note: Card 13, card 14, . . . are repeated with respect to the number of input points indicated on card 4, IPTS.

Note: Card 2 to card 13, card 14, . . . are repeated according to the number of times identified on card 1, NRUN.

23

9. JOB CONTROL LANGUAGE FOR EMPFIT

The following JCL is necessary to execute EMPFIT on the HDL IBM 370/168 computer. The procedure ANAFORT is used to supply the plotting software while the object version of EMPFIT exists on permanent file.

```
//Job Card
/*JOBPARM CARDS=20000
//ST EXEC ANAFORT,PPELIB='HK3002.EMPFIT',OUT=X,F3=
//FORT.SYSIN DD *
//LKED.SYSIN DD *
  INCLUDE SYSLIB(EMPFIT)
  ENTRY MAIN
//GO.FT10F001  DD  DISP=(NEW,CATLG),VOL=SER=USER02,
//   UNIT=SYSDA,SPACE=(TRK,(2,2)),DSN=permanent file
     name for curve fit output data,DCB=(RECFM=VS)
//GO.FT11F001  DD  DISP=(NEW,CATLG),VOL=SER=USER02,
//   UNIT=SYSDA,SPACE=(TRK,(2,2)),DSN=permanent file
     name for derivative output data,DCB=(RECFM=VS)
//GO.FT12F001  DD  DSN=permanent file name of disk
     file input data,DISP=SHR
//GO.SYSIN DD *

              Input Data

//
```

The control cards in braces should only be used if the respective read or write option of EMPFIT is employed.

24

APPENDIX A.--SAMPLE RUN AND LISTING OF EMPFIT

This appendix shows a sample run of EMPFIT and lists its main program and subroutines. Figures A-1 to A-3 show sample plots from EMPFIT.

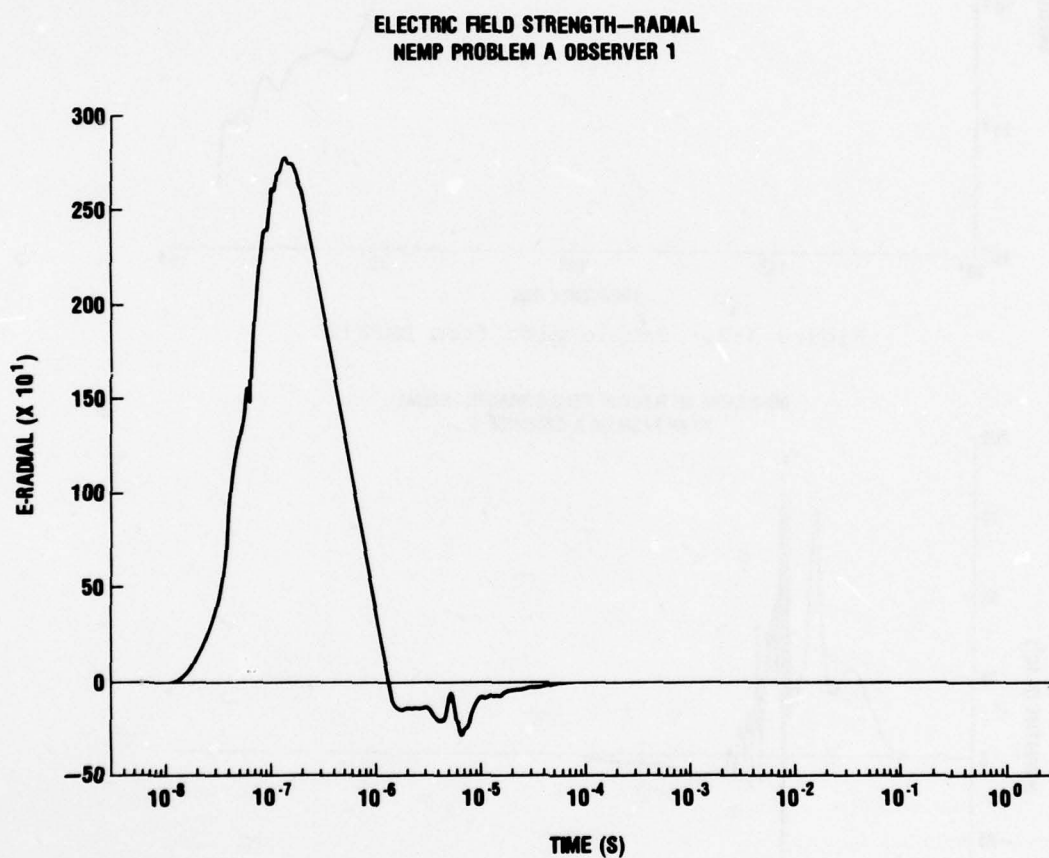**ELECTRIC FIELD STRENGTH—RADIAL**
NEMP PROBLEM A OBSERVER 1

Figure A-1. Sample plot from EMPFIT.

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APPENDIX A
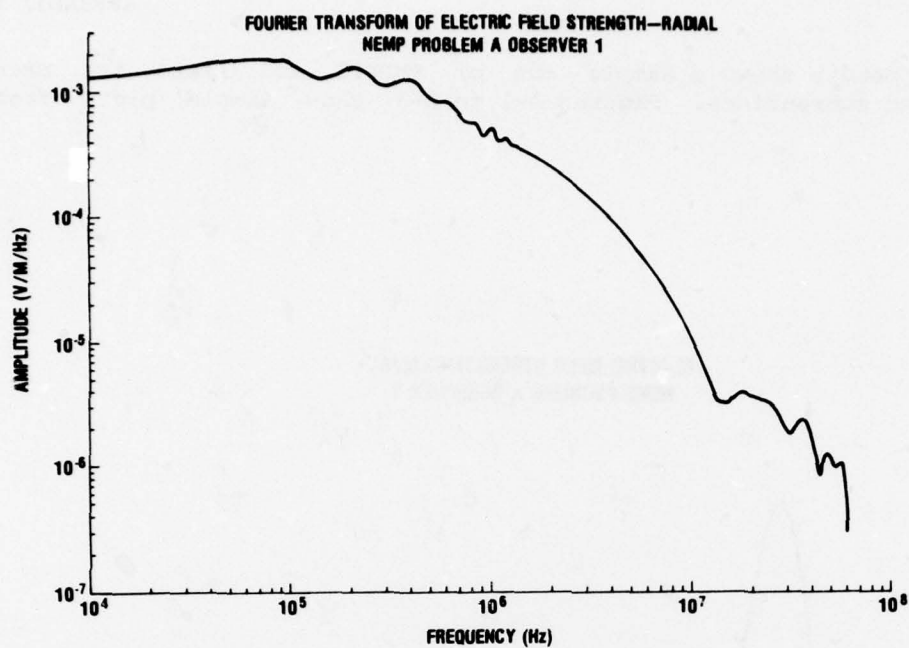
Figure A-2.   Sample plot from EMPFIT.

Figure A-3.   Sample plot from EMPFIT.

28

LEVEL 2.2 (SEPT 76)　　　OS/360　FORTRAN H EXTENDED PLUS　　　DATE 77.325/14.19.07　　PAGE 1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
　　　　SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

```
                    FUNCTIONS INLINE ARE:   NCNE

                    PROGRAM EMPFIT(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE3,
             C                   TAPE10,TAPE11,TAPE12)
             C
ISN 0002            INTEGER TITLE
ISN 0003            COMMON/A/ ORDMIN,IDENT,IFFT,TITLE(20),IPLOT,ILNLOG
ISN 0004            COMMON/H/ IOT,IFPRIM,IPERM,IFPPLT
ISN 0005            READ(5,10) NRUN
ISN 0006      10    FORMAT(7X,I3)
ISN 0007            DO 50 L=1,NRUN
             C
             C      READ IN INPUT DATA
ISN 0008            CALL INPUTT
             C
             C      CALCULATE CURVE FIT
ISN 0009            CALL CURFIT
             C
             C      CALCULATE FOURIER TRANSFORM
ISN 0010            IF(IFFT.EQ.1) GO TO 20
ISN 0012            CALL FORT
             C
             C      WRITE OUTPUT
ISN 0013      20    CALL OTPUT
             C
             C      PLOT DATA
ISN 0014            IF(IPLOT.EQ.1) GO TC 30
ISN 0016            CALL PLOTT
ISN 0017      30    CONTINUE
             C
             C      WRITE DATA ON PERMANENT FILE
ISN 0018            IF(IPERM.EQ.0) GO TO 40
ISN 0020            CALL RITDAT
ISN 0021      40    CONTINUE
ISN 0022      50    CONTINUE
ISN 0023            STOP
ISN 0024            END
```

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT　FUNCTIONS INLINE ARE:　NONE

OPTIONS IN EFFECT

STATISTICS　　SOURCE STATEMENTS =　　23, PROGRAM SIZE =　　424, SUBPROGRAM NAME = MAIN

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.09   PAGE 1

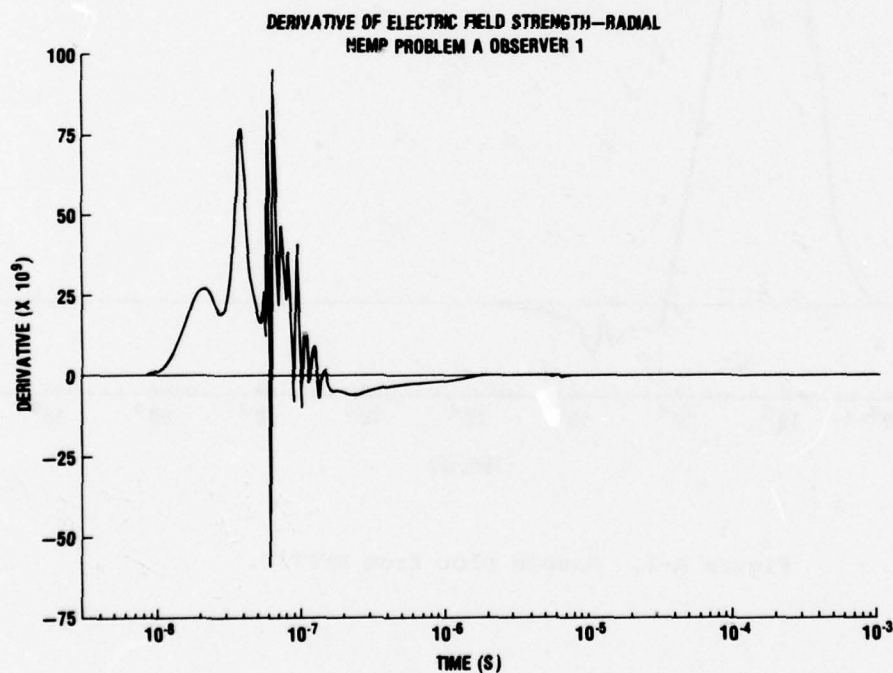LEVEL 2.2 (SEPT 76)

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

FUNCTIONS INLINE ARE: NONE

```
ISN 0002        SUBROUTINE INPUT
ISN 0003        COMPLEX FT
ISN 0004        INTEGER XTITLE,YTITLE,ATITLE,TITLE
ISN 0005        COMMON/A/ ORDMIN,IDENT,IFFT,TITLE(20),IPLOT,ILNLOG
ISN 0006        COMMON/B/ T(500),F(500),ALPHA,BETA,TT(5000),FF(5000),
               .          DF(500),DFF(5000)
ISN 0007        COMMON/C/ TMAX,TCUT,NPTS,MPTS,IPTS,MAXPTS,OPTS,ICUT
ISN 0008        COMMON/D/ DELF,OSTART,OMAX,OMEGA(5000),FT(5000)
ISN 0009        COMMON/G/ ICURV
ISN 0010        COMMON/H/ IDT,IFPRIM,IPERM,IFPPL
ISN 0011        COMMON/K/ TX(100),FY(100),IREAD,IDELET,IADD,NIADD,NSETS,NUM(8)
ISN 0012        DIMENSION XTITLE(10),YTITLE(10),ATITLE(10)
ISN 0013        READ(5,10) IDENT,IFFT,IPLOT,ILNLOG,ORDMIN,ICURV,ICT,IREAD
ISN 0014     10 FORMAT(4(9X,I1),E10.3,3(9X,I1))
ISN 0015        READ(5,20) (TITLE(I),I=1,20)
ISN 0016     20 FORMAT(20A4)
ISN 0017        READ(5,30) IPTS,MPTS,TMAX,ALPHA,BETA,OSTART,OMAX,ICUT
ISN 0018     30 FORMAT(7X,I3,7X,I3,5E10.3,9X,I1)
ISN 0019        IF(ICUT.EQ.1) READ(5,33) TCUT
ISN 0021     33 FORMAT(E10.3)
ISN 0022        MPTS=IPTS+1
ISN 0023        IF(IDT.EQ.0)  GO TO 35
ISN 0025        CALL ENTITL(1,XTITLE,YTITLE,ATITLE)
ISN 0026     35 CONTINUE
C
C  READ TIME DERIVATIVE INFORMATION
C
ISN 0027        IF(IREAD.EQ.2.OR.IREAD.EQ.3) READ(5,36) IFPRIM,IPERM,IFPPLT
C
C  READ PERMANENT FILE DATA
C
ISN 0029        IF(IREAD.EQ.1.OR.IREAD.EQ.3) READ(5,36) NSETS,IDELET,IADD
ISN 0031     36 FORMAT(3(9X,I1))
ISN 0032        IF(IDELET.EQ.1) READ(5,37) (NUM(I),I=1,8)
ISN 0034     37 FORMAT(8(7X,I3))
ISN 0035        IF(IADD.EQ.1) READ(5,38) NIADD,(TX(I),FY(I),I=1,NIADD)
ISN 0037     38 FORMAT(7X,I3,6E10.3)
ISN 0038        IF(IREAD.EQ.1.OR.IREAD.EQ.3) CALL PERFIL
ISN 0040        IF(IREAD.EQ.1.OR.IREAD.EQ.3) GO TO 60
C
C  READ DATA POINTS
C
ISN 0042        DO 50 I=2,NPTS
ISN 0043        READ(5,40) T(I),F(I)
ISN 0044     40 FORMAT(2E10.3)
ISN 0045     50 CONTINUE
ISN 0046     60 IF(ICUT.EQ.1) CALL CUTOFF
ISN 0048        RETURN
ISN 0049        END
```

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

EVEL 2.2 (SEPT 76)   CS/360   FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.10   PAGE   1

QUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

TIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                 SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

                 FUNCTIONS INLINE ARE: NONE

```
ISN 0002          SUBROUTINE CURFIT
ISN 0003          INTEGER CPTS
ISN 0004          COMMON/B/ T(500),F(500),ALPHA,BETA,TT(5000),FF(5000),
                 '         DF(500),DFF(5000)
ISN 0005          COMMON/C/ TMAX,TCUT,NPTS,MPTS,IPTS,MAXPTS,OPTS,ICUT
ISN 0006          COMMON/E/ A1,A2,A3,A4,C1,CNM1,C2,DNM
ISN 0007          COMMON/H/ IOT,IFPRIM,IPERM,IFPPLT
ISN 0008          COMMON/K/ TX(100),FY(100),IREAD,IDELET,IADD,NIADD,NSETS,NUM(8)
ISN 0009          I=2
ISN 0010          J=2
ISN 0011          T(1)=.8*T(2)
ISN 0012          F(1)=0.
ISN 0013          TT(1)=T(1)
ISN 0014          FF(1)=0.
ISN 0015          T(NPTS+1)=TMAX
ISN 0016          CALL A1A3(A1,A3,C1)
ISN 0017          CALL A2A4(A2,A4,DNM)
ISN 0018    10    H=T(J)-T(J-1)
ISN 0019    20    TT(J)=TT(J-1)+DEL
ISN 0020          DEL=H/(MPTS-1)
ISN 0021          IF(TT(I).LT.(T(J)-DEL/100.)) GO TO 30
ISN 0023          IF(TT(I).GT.T(NPTS)) GO TO 50
ISN 0025          TT(I)=T(J)
ISN 0026          FF(I)=F(J)
ISN 0027          I=I+1
ISN 0028          J=J+1
ISN 0029          GO TO 10
ISN 0030    30    CONTINUE
ISN 0031          IF(TT(I).GT.T(2)) GO TO 50
ISN 0033          ARG1=ALPHA*TT(I)
ISN 0034          ARG2=-2.*ARG1
ISN 0035          FF(I)=A1*EXP(ARG1)+A3*EXP(ARG2)
ISN 0036          I=I+1
ISN 0037          GO TO 20
ISN 0038    50    IF(TT(I).LT.T(NPTS)) GO TO 60
ISN 0040          ARG3=-BETA*TT(I)
ISN 0041          ARG4=-2.*ARG3
ISN 0042          FF(I)=A2*EXP(ARG3)+A4*EXP(ARG4)
ISN 0043          IF(TT(I).GE.TMAX) GO TO 90
ISN 0045          I=I+1
ISN 0046          GO TO 20
ISN 0047    60    CONTINUE
ISN 0048          DT=TT(I)-T(J-1)
ISN 0049          DTN=T(J)-TT(I)
ISN 0050          DTNN=T(J)-T(J-1)
ISN 0051          DTPI=TT(I)-T(J)
ISN 0052          IF(J.NE.NPTS) GO TO 70
ISN 0054          GO TO 80
ISN 0055    70    D=DN(J)
```

31

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   CURFIT   OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.10   PAGE 2

```
ISN 0057   80   P1=(F(J))*DT*F(J-1)*DTN1/DTNN
ISN 0058        P2=-.5*(BN(J-1)+BN(J))*DT*DTP1
ISN 0059        P3=CN(J-1)*DT*(DTN**3)
ISN 0060        P4=D*DTN*(DT**3)
ISN 0061        FF(I)=P1+P2+P3+P4
ISN 0062        I=I+1
ISN 0063        GO TO 20
ISN 0064   90   CONTINUE
ISN 0065        MAXPTS=I
ISN 0066        OPTS=MAXPTS
           C
           C    CALCULATE TIME DERIVATIVE
           C
ISN 0067        IF(IREAD.EQ.2.OR.IREAD.EQ.3)  CALL DERIV
ISN 0069        L=0
ISN 0070        DO 100 I=2,NPTS
ISN 0071        L=L+1
ISN 0072        T(L)=T(I)
ISN 0073        F(L)=F(I)
ISN 0074   100  CONTINUE
ISN 0075        RETURN
ISN 0076        END
```

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT   FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   75, PROGRAM SIZE =   1994, SUBPROGRAM NAME =CURFIT

STATISTICS NO DIAGNOSTICS GENERATED

******* END OF COMPILATION *******   200K BYTES OF CORE NOT USED

32

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.12   PAGE   1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(O)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

                   FUNCTIONS INLINE ARE: NONE

ISN 0002   SUBROUTINE FORT
ISN 0003   REAL IPFT
ISN 0004   INTEGER OPTS
ISN 0005   COMPLEX FT
ISN 0006   COMMON/B/ TI(500),FI(500),ALPHA,BETA,TT(5000),FF(5000),
                 .   DF(500),DFF(5000)
ISN 0007   COMMON/C/ TMAX,TCUT,NPTS,MPTS,IPTS,MAXPTS,OPTS,ICUT
ISN 0008   COMMON/D/ DELF,OSTART,CMAX,CPEGA(5000),FI(5000)
ISN 0009   COMMON/E/ A1,A2,A3,A4,C1,CNM1,D2,DNM
ISN 0010   COMMON/F/ RPFT(1000),IPFT(10C0),ZABS(1000)
ISN 0011   DATA TOPI/6.2831853/
ISN 0012   OMEGA(1)=OSTART
ISN 0013   DELF=(OMAX/OSTART)**(1./(OPTS-1))
ISN 0014   DO 10 J=1,OPTS
ISN 0015   OMEGA(J+1)=OMEGA(J)*TOPI,TT,FF,OPTS)
ISN 0016   CALL FLINE(FT(J),OMEGA(J)*TOPI,TT,FF,OPTS)
ISN 0017   10 CONTINUE
ISN 0018   DO 20 J=1,OPTS
ISN 0019   RPFT(J)=REAL(FT(J))
ISN 0020   IPFT(J)=AIMAG(FT(J))
ISN 0021   ARG=RPFT(J)**2+IPFT(J)**2
ISN 0022   ZABS(J)=SQRT(ARG)
ISN 0023   20 CONTINUE
ISN 0024   RETURN
ISN 0025   END

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   24, PROGRAM SIZE =   786, SUBPROGRAM NAME = FORT

STATISTICS NC DIAGNOSTICS GENERATED

***** END OF COMPILATION *****   208K BYTES OF CORE NOT USED

33

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360   FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.14   PAGE 1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NCALC NOANSF NOTERM FLAG(I)

FUNCTIONS INLINE ARE: NONE

```
ISN 0002          SUBROUTINE OTPUT
ISN 0003          COMPLEX FT
ISN 0004          INTEGER DPTS,FTITLE,TITLE,XTITLE,YTITLE,ATITLE
ISN 0005          COMMON/A/ ORDMIN,IDENT,IFFT,TITLE(20),IPLOT,ILMLOG
ISN 0006          COMMON/B/ T(500),F(500),ALPHA,BETA,IT(5000),FF(5000),
                 .         DF(500),DFF(5000)
ISN 0007          COMMON/C/ TMAX,TCUT,MPTS,MPTS,IPTS,MAXPTS,DPTS,ICUT
ISN 0008          COMMON/D/ DELF,DSTART,OMAX,OMEGA(5000),FT(5000)
ISN 0009          COMMON/H/ IOT,IFPRIM,IPERM,IFPPLT
ISN 0010          COMMON/J/ALFA,BET,AL,BE,LA1,LA2
ISN 0011          COMMON/K/ TX(100),FY(100),IREAD,IDELET,IADD,NIACD,NSETS,NUM(8)
ISN 0012          DIMENSION ATITLE(10),XTITLE(10),YTITLE(10)
ISN 0013          DATA ATITLE/10*4H     /,XTITLE/10*4H     /,YTITLE/10*4H
ISN 0014          IF(ICT.EQ.1) GO TO 5
ISN 0016          CALL ANOTAT(XTITLE,YTITLE,ATITLE,0)
ISN 0017          GO TO 7
ISN 0018     5    CALL ENTITL(0,XTITLE,YTITLE,ATITLE)
ISN 0019     7    WRITE(6,10)
ISN 0020     10   FORMAT(1H1)
ISN 0021          WRITE(6,20) (TITLE(I),I=1,20)
ISN 0022     20   FORMAT(2X,20A4)
ISN 0023          WRITE(6,30) (ATITLE(I),I=1,1C)
ISN 0024     30   FORMAT(/,6X,13HINPUT DATA -  ,10A4)
ISN 0025          WRITE(6,40) AL,BE,TMAX,IPTS,MPTS
ISN 0026     40   FORMAT(/,9X,7HALPHA= ,1PE11.3,5X,6HBETA= ,1PE11.3,5X,
                 13HMAXIMUM TIME TO BE CALCULATED= ,1PE11.3,/,9X,
                 229HNUMBER OF INPUT DATA POINTS=  ,I3,5X,
                 355HNUMBER OF POINTS CALCULATED BETWEEN INPUT DATA POINTS=  ,I3)
ISN 0027          IF(ICUT.EQ.1) WRITE(6,41) TCUT
ISN 0029     41   FORMAT(9X,22HCUTOFF TIME EMPLOYED= ,1PE11.3)
ISN 0030          IF(LA1.EQ.1) WRITE(6,43) ALFA
ISN 0032     43   FORMAT(9X,30HMAXIMUM VALUE FCR ALPHA USED= ,1PE11.3)
ISN 0033          IF(LA2.EQ.1) WRITE(6,45) BET
ISN 0035     45   FORMAT(9X,29HMAXIMUM VALUE FCR BETA USED= ,1PE11.3)
ISN 0036          WRITE(6,50) (XTITLE(I),I=1,3),(YTITLE(I),I=1,3),(XTITLE(I),
                 '1=1,3),(YTITLE(I),I=1,3),(XTITLE(I),I=1,3),(YTITLE(I),I=1,3)
ISN 0037     50   FORMAT(/,13X,2A4,A2,4X,3A4,2(1CX,2A4,A2,4X,3A4))
ISN 0038          WRITE(6,60)
ISN 0039     60   FORMAT(3(12X,25(1H-)))
ISN 0040          CALL COLMNS(3,IPTS,T,F)
ISN 0041          WRITE(6,80) IPTS
ISN 0042     80   FORMAT(/,15X,19HNUMBER OF POINTS = ,I3)
ISN 0043          WRITE(6,10)
ISN 0044          WRITE(6,90)
ISN 0045     90   FORMAT(/,6X,22HCURVE FIT CALCULATIONS)
ISN 0046          WRITE(6,95) ORDMIN
ISN 0047     95   FORMAT(/,9X,41HMINIMUM VALUE OF ORDINATE TO BE PLOTTED=  .
                 11PE11.3)
ISN 0048          WRITE(6,50) (XTITLE(I),I=1,3),(YTITLE(I),I=1,3),(XTITLE(I),
                 '1=1,3),(YTITLE(I),I=1,3),(XTITLE(I),I=1,3),(YTITLE(I),I=1,3)
```

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OTPUT   (S/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.14   PAGE 2

```
ISN 0049          WRITE(6,60)
ISN 0050          CALL COLMNS(3,MAXPTS,TT,FF)
ISN 0051          WRITE(6,80) MAXPTS
ISN 0052          IF(IFFT.EQ.1) GO TO 140
ISN 0054          CALL ANOTAT(XTITLE,YTITLE,ATITLE,1)
ISN 0055          WRITE(6,10)
ISN 0056          WRITE(6,100)
ISN 0057      100 FORMAT(/,6X,30HFOURIER TRANSFORM CALCULATIONS)
ISN 0058          WRITE(6,110) DSTART,DELF,OMAX
ISN 0059      110 FORMAT(/,9X,27HSTARTING FREQUENCY(HERTZ)= ,1PE11.3,5X,
             117HDELTA FREQUENCY= ,1PE11.3,/,9X,
             236HMAXIMUM FREQUENCY TO BE CALCULATED= ,1PE11.3)
ISN 0060          WRITE(6,120) (XTITLE(I),I=1,4),(YTITLE(I),I=1,5),(XTITLE(I),
             *I=1,4),(YTITLE(I),I=1,5)
ISN 0061      120 FORMAT(/,/,12X,4A4,7X,5A4,6X,4A4,7X,5A4,/,2(20X,4HREAL,7X,
             *9HIMAGINARY,1X))
ISN 0062          WRITE(6,130)
ISN 0063      130 FORMAT(2(11X,36(1H-)))
ISN 0064          CALL COLMNS(1,OPTS,OMEGA,FT)
ISN 0065          WRITE(6,80) OPTS
ISN 0066      140 CONTINUE
ISN 0067          IF(IREAD.EQ.0.OR.IREAD.EQ.1) GO TO 200
ISN 0069          IF(ICT.EQ.1) GO TO 150
ISN 0071          CALL ANOTAT(XTITLE,YTITLE,ATITLE,0)
ISN 0072          GO TO 160
ISN 0073      150 CALL ENTITL(0,XTITLE,YTITLE,ATITLE)
ISN 0074      160 WRITE(6,10)
ISN 0075          WRITE(6,170)
ISN 0076      170 FORMAT(/,/,6X,28HTIME DERIVATIVE CALCULATIONS)
ISN 0077          WRITE(6,180)
ISN 0078      180 FORMAT(/,/,27X,13HDERIVATIVE OF,2(23X,13HDERIVATIVE OF))
ISN 0079          WRITE(6,190) (XTITLE(I),I=1,3),(YTITLE(I),I=1,3),(XTITLE(I),
             *I=1,3),(YTITLE(I),I=1,3),(XTITLE(I),I=1,3),(YTITLE(I),I=1,3)
ISN 0080      190 FORMAT(13X,2A4,A2,4X,3A4,2(1CX,2A4,A2,4X,3A4))
ISN 0081          WRITE(6,60)
ISN 0082          CALL COLMNS(3,MAXPTS,TT,DFF)
ISN 0083          WRITE(6,80) MAXPTS
ISN 0084      200 RETURN
ISN 0085          END
```

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NCALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS SOURCE STATEMENTS = 84, PROGRAM SIZE = 2852, SUBPROGRAM NAME = OTPUT

STATISTICS NO DIAGNOSTICS GENERATED

****** END OF COMPILATION ******   192K BYTES OF CORE NOT USED

APPENDIX A

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

FUNCTIONS INLINE ARE: NONE

```
ISN 0002              SUBROUTINE COLMNS(L,KPTS,X,Y)
ISN 0003              COMPLEX FT
ISN 0004              DIMENSION X(1),Y(1)
ISN 0005              COMMON/D/ DELF,OSTART,OMAX,OMEGA(5000),FT(5000)
ISN 0006              IF(L.EQ.2)   GO TO 40
ISN 0008              IF(L.EQ.3)   GO TO 40
ISN 0010              INC=KPTS/2
ISN 0011              IK=MOD(KPTS,2)
ISN 0012              ICOL=INC+1
ISN 0013              IF(IK.EQ.0)  GO TO 10
ISN 0015              IF(IK.EQ.1)  GO TO 30
ISN 0017           10 WRITE(6,20) (OMEGA(I),FT(I),CMEGA(I+INC),FT(I+INC),I=1,INC)
ISN 0018           20 FORMAT(2(11X,1PE11.3,3X,1PE11.3,2X,1PE11.3))
ISN 0019              RETURN
ISN 0020           30 WRITE(6,20) (OMEGA(I),FT(I),CMEGA(I+ICOL),FT(I+ICOL),I=1,INC)
ISN 0021              WRITE(6,20) OMEGA(ICOL),FT(ICOL)
ISN 0022              RETURN
ISN 0023           40 INC=KPTS/3
ISN 0024              IK=MOD(KPTS,3)
ISN 0025              ICOL=INC+1
ISN 0026              IF(L.FQ.2)   GO TO 90
ISN 0028              IF(IK.EQ.0)  GO TO 50
ISN 0030              IF(IK.EQ.1)  GO TO 70
ISN 0032              IF(IK.EQ.2)  GO TO 80
ISN 0034           50 WRITE(6,60) (X(I),Y(I),X(I+INC),Y(I+INC),X(I+2*INC),Y(I+2*INC),
                     1I=1,INC)
ISN 0035           60 FORMAT(3(11X,1PE11.3,3X,1PE11.3))
ISN 0036              RETURN
ISN 0037           70 WRITE(6,60) (X(I),Y(I),X(I+ICOL),Y(I+ICOL),X(I+2*ICOL),X(I+2*ICOL-1),
                     1Y(I+2*ICOL-1),I=1,INC)
ISN 0038              WRITE(6,60) X(ICOL),Y(ICOL)
ISN 0039              RETURN
ISN 0040           80 WRITE(6,60) (X(I),Y(I),X(I+ICOL),Y(I+ICOL),X(I+2*ICOL),
                     1Y(I+2*ICOL),I=1,INC)
ISN 0041              WRITE(6,60) X(ICOL),Y(ICOL),X(I2*ICOL),Y(2*ICOL)
ISN 0042              RETURN
ISN 0043           90 CONTINUE
ISN 0044              IF(IK.EQ.0)  GO TO 100
ISN 0046              IF(IK.EQ.1)  GO TO 130
ISN 0048              IF(IK.EQ.2)  GO TO 150
ISN 0050          100 DO 110 I=1,INC
ISN 0051              JINC=J+INC
ISN 0052              I2INC=I+2*INC
ISN 0053              WRITE(6,120) I,X(I),Y(I),JINC,X(JINC),Y(JINC),I2INC,X(I2INC),
                     YI2INC)
ISN 0054          110 CONTINUE
ISN 0055          120 FORMAT(3(I4,X,I3,4X,1PE11.3,3X,1PE11.3))
ISN 0056              RETURN
ISN 0057          130 DO 140 I=1,INC
ISN 0058              IICOL=I+ICOL
```

36

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   COLMNS   OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.15   PAGE 2

```
ISN 0059        I2ICOL=I+2*ICOL-1
ISN 0060        WRITE(6,120) I,X(I),Y(I),I1CCL,X(I1COL),Y(I1COL),I2ICOL,I2ICOL,X(I2ICOL),
               . Y(I2ICOL)
ISN 0061    140 CONTINUE
ISN 0062        WRITE(6,120) ICOL,X(ICOL),Y(ICOL)
ISN 0063        RETURN
ISN 0064    150 DO 160 I=1,INC
ISN 0065        I1COL=I+ICOL
ISN 0066        I2ICOL=I+2*ICOL
ISN 0067        WRITE(6,120) I,X(I),Y(I),I1CCL,X(I1COL),Y(I1COL),I2ICOL,X(I2ICOL),
               . Y(I2ICOL)
ISN 0068    160 CONTINUE
ISN 0069        I2COL=2*ICOL
ISN 0070        WRITE(6,120) ICOL,X(I1CCL),Y(I1CCL),I2COL,X(I2COL),Y(I2CCL)
ISN 0071        RETURN
ISN 0072        END
```

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC BEANSF NOTERM FLAG(I)

OPTIONS IN EFFECT   FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   71, PROGRAM SIZE =   2894, SUBPROGRAM NAME =COLMNS

STATISTICS   NO DIAGNOSTICS GENERATED

****** END OF COMPILATION ******   196K BYTES OF CORE NOT USED

37

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.17   PAGE 1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

FUNCTIONS INLINE ARE: NONE

```
ISN 0002          SUBROUTINE PLOTT
ISN 0003          REAL IPFT
ISN 0004          COMPLEX FT
ISN 0005          INTEGER OPTS,FTITLE
ISN 0006          INTEGER XTITLE,YTITLE,ATITLE,TITLE
ISN 0007          COMMON/A/ ORDMIN,IDENT,IFFT,TITLE(20),IPLOT,ILNLOG
ISN 0008          COMMON/B/ TT(500),F(5C0),ALPHA,BETA,TT(5000),FF(5000),
                 .         DF(500),DFF(5000)
ISN 0009          COMMON/C/ TMAX,TCUT,NPTS,MPTS,IPTS,MAXPTS,OPTS,ICUT
ISN 0010          COMMON/D/ DELF,OSTART,OMAX,OMEGA(5000),FT(5000)
ISN 0011          COMMON/E/ A1,A2,A3,A4,C1,CNM1,D2,DMN
ISN 0012          COMMON/F/ RPFT(1000),IPFT(10C0),ZABS(1000)
ISN 0013          COMMON/G/ ICURV
ISN 0014          COMMON/H/ IOT,IFPRIM,IPERM,IFPPLT
ISN 0015          DIMENSION FTITLE(14),ATITLE(10),XTITLE(10),YTITLE(10)
ISN 0016          DATA FTITLE/14*4H    /,ATITLE/10*4H    /,XTITLE/10*4H    /,
                 .         YTITLE/10*4H    /
ISN 0017          IF(ILNLOG.EQ.2) GO TO 2
ISN 0019          L=0
ISN 0020          DO 1 I=1,MAXPTS
ISN 0021          IF(FF(I).LT.ORDMIN) GO TO 1
ISN 0023          L=L+1
ISN 0024          TT(L)=TT(I)
ISN 0025          FF(L)=FF(I)
ISN 0026        1 CONTINUE
ISN 0027          MAXPTS=L
ISN 0028          GO TO 4
ISN 0029        2 CONTINUE
ISN 0030          DO 3 I=1,MAXPTS
ISN 0031          IF(FF(I).LT.ORDMIN) TT(I)=0.
ISN 0033        3 CONTINUE
ISN 0034        4 CONTINUE
ISN 0035          IF(IOT.EQ.1) GO TO 5
ISN 0037          CALL ANOTAT(XTITLE,YTITLE,ATITLE,0)
ISN 0038          GO TO 7
ISN 0039        5 IF(ICURV.EQ.1) GO TO 8
ISN 0040        7 CALL ENTITL(0,XTITLE,YTITLE,ATITLE,TITLE)
ISN 0042          CALL DRAW4(1,3,3,8,20,XTITLE,YTITLE,ATITLE,TITLE)
ISN 0043          CALL DRAW4(2,3,ILNLOG,IPTS,-2,10,T,F,0.,0.)
ISN 0044          CALL DRAW4(2,3,ILNLOG,MAXPTS,0,1C,TT,FF,0.,0.)
ISN 0045          CALL DRAW4(3,0,0,0,MAXPTS,TT,FF,2.,0.)
ISN 0046          IF(ICURV.EQ.0) GO TO 9
ISN 0048        8 CONTINUE
ISN 0049          CALL DRAW4(1,3,3,8,20,XTITLE,YTITLE,ATITLE,TITLE)
ISN 0050          CALL DRAW4(2,3,ILNLOG,MAXPTS,0,10,TT,FF,0.,0.)
ISN 0051          CALL DRAW4(3,3,0,0,0,MAXPTS,TT,FF,2.,0.)
ISN 0052        9 CONTINUE
ISN 0053          IF(IFFT.EQ.1) GO TO 20
ISN 0054          CALL ANOTAT(XTITLE,YTITLE,FTITLE,1)
ISN 0056          DO 10 J=7,14
```

38

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

```
LEVEL 2.2  (SEPT 76)      PLOTT      OS/360 FORTRAN H EXTENDED PLUS      DATE 77.325/14.19.17      PAGE  2

ISN 0057          K=J-6
ISN 0058          FTITLE(J)=ATITLE(K)
ISN 0059    10    CONTINUE
ISN 0060          CALL DRAW4(1,3,4,5,14,20,XTITLE,YTITLE,FTITLE,TITLE)
ISN 0061          CALL DRAW4(2,3,2,OPTS,0,10,OMEGA,ZABS,0.,0.)
ISN 0062          CALL DRAW4(3,3,0,0,OPTS,OMEGA,ZABS,2.,0.)
ISN 0063    20    CONTINUE
ISN 0064          IF(IFPPLT.EQ.0) GO TO 60
ISN 0066          IF(IIOT.EQ.1) GO TO 30
ISN 0068          GO TO 40
ISN 0069    30    CALL ANOTA(XTITLE,YTITLE,ATITLE,0)
ISN 0070          GO TO 40
ISN 0071    40    CONTINUE
ISN 0072          CALL ANOTA(XTITLE,YTITLE,FTITLE,2)
ISN 0073          DO 50 J=5,12
ISN 0074          K=J-4
ISN 0075          FTITLE(J)=ATITLE(K)
ISN 0076    50    CONTINUE
ISN 0077          CALL DRAW4(1,3,3,12,20,XTITLE,YTITLE,FTITLE,TITLE)
ISN 0078          CALL DRAW4(2,3,ILMLOG,MAXPT5,0,10,1T,DFF,0.,0.)
ISN 0079          CALL DRAW4(3,3,0,0,MAXPT5,1T,DFF,2.,0.)
ISN 0080    60    RETURN
ISN 0081          END

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(05COK) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT AGMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

*OPTIONS IN EFFECT*  FUNCTIONS INLINE APE:  NONE

*OPTIONS IN EFFECT*

*STATISTICS*   SOURCE STATEMENTS =      80, PROGRAM SIZE =     1804, SUBPROGRAM NAME = PLOTT

*STATISTICS* NO DIAGNOSTICS GENERATED

******END OF COMPILATION ******                       196K BYTES OF CORE NOT USED
```

APPENDIX A

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

        FUNCTIONS INLINE ARE: NONE

```
ISN 0002            SUBROUTINE ANOTAT(XTITLE,YTITLE,ATITLE,IZ)
ISN 0003            INTEGER TIME,ERAD,YERAD,EVER,YEVER,BAZ,YBAZ,YJRAD,YJVER,SIG
ISN 0004            INTEGER YSIG,FOUR,XFOUR,YFOUR,YDER,DRIV,VFOR
ISN 0005            INTEGER XTITLE,YTITLE,ATITLE,TITLE
ISN 0006            COMMON/A/ ORDMIN,IDENT,IFFT,TITLE(20),IPLOT,ILMLOG
ISN 0007            COMMON/H/ IOT,IFPRIM,IPERM,IFPPLT
ISN 0008            DIMENSION ATITLF(8),XTITLE(4),YTITLE(5)
ISN 0009            DIMENSION TIME(4),ERAD(8),YERAD(5),EVER(8),YEVER(5),BAZ(8),
                   .     YBAZ(5),YJRAD(8),YJRAD(8),JVER(8),YJVER(5),SIG(8),
                   .     YSIG(5),FOUR(8),XFOUR(4),YFOUR(5),YDER(5),DRIV8),
                   .     VFOR(5)
ISN 0010            DATA TIME/4HTIME,4H (SE,4HC) ,4H-                           /
                   .     ERAD/4HELEC,4HTRIC,4H FIE,4HLD S,4HTREN,4HGTH-,4HRAD1,4HAL  /
                   .     YERAD/4HE-RA,4HDIAL,3°4H                               /
                   .     EVER/4HELEC,4HTRIC,4H FIE,4HLD S,4HTREN,4HGTH-,4HVERT,4HICAL/
                   .     YEVER/4HE-VE,4HRTIC,4HAL  ,2°4H                        /
                   .     BAZ/4HMAGN,4HETIC,4H IND,4HUCTI,4HON-A,4HZIMU,4HTHAL,4H     /
                   .     YBAZ/4HB-AZ,4HIMUT,4HHAL ,2°4H                         /
                   .     JRAD/4HCURR,4HENT ,4HDEAS,4H-ITY-,4HRADI,4HAL  ,2°4H    /
                   .     YJRAD/4HJ-RA,4HCIAL,3°4H                               /
                   .     JVER/4HCURR,4HENT ,4HDENS,4HITY-,4HVERT,4HICAL,2°4H     /
                   .     YJVER/4HJ-VE,4HRTIC,4HAL  ,2°4H                        /
                   .     SIG/4HAIR ,4HCOND,4FUCTI,4HVITY,4°4H                    /
                   .     YSIG/4HSIGM,4HA   ,3°4H                                /
                   .     FOUR/4H  F ,4HOURI,4HER T,4HRANS,4HFORM,4H OF ,2°4H     /
                   .     XFOUR/4HFREQ,4HUENC,4HY(HZ,4H)   ,4H                    /
                   .     YFOUR/4HAMPL,4HITUD,4HE(V/,4HM/HZ,4H)                   /
                   .     YFOR/4HAMPL,4HITUD,4HE     ,2°4H                        /
                   .     YDER/4HDERI,4HVAT1,4HVE  ,2°4H                         /
                   .     DRIV/4H  DE,4FRIVA,4HTIVE,4F OF ,4°4H                   /
ISN 0011            IF(IZ.EQ.1)  GO TO 200
ISN 0013            DO 10 I=1,4
ISN 0014            XTITLE(I)=TIME(I)
ISN 0015         10 CONTINUE
ISN 0016            IF(IZ.EQ.2)  GO TO 240
ISN 0018            GO TO (20,50,80,110,140,170),IDENT
ISN 0019            DO 30 I=1,8
ISN 0020            ATITLE(I)=ERAD(I)
ISN 0021         30 CONTINUE
ISN 0022            DO 40 I=1,5
ISN 0023            YTITLE(I)=YERAD(I)
ISN 0024         40 CONTINUE
ISN 0025            RETURN
ISN 0026         50 DO 60 I=1,8
ISN 0027            ATITLE(I)=EVER(I)
ISN 0028         60 CONTINUE
ISN 0029            DO 70 I=1,5
ISN 0030            YTITLE(I)=YEVER(I)
ISN 0031         70 CONTINUE
ISN 0032            RETURN
```

40

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   ANDTAT   OS/360   FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.20   PAGE   2

```
ISN 0033            80  DO 90 I=1,8
ISN 0034                ATITLE(I)=BAZ(I)
ISN 0035            90  CONTINUE
ISN 0036                DO 100 I=1,5
ISN 0037                YTITLE(I)=YBAZ(I)
ISN 0038           100  CONTINUE
ISN 0039                RETURN
ISN 0040           110  DO 120 I=1,8
ISN 0041                ATITLE(I)=JRAD(I)
ISN 0042           120  CONTINUE
ISN 0043                DO 130 I=1,5
ISN 0044                YTITLE(I)=YJRAD(I)
ISN 0045           130  CONTINUE
ISN 0046                RETURN
ISN 0047           140  DO 150 I=1,8
ISN 0048                ATITLE(I)=JVER(I)
ISN 0049           150  CONTINUE
ISN 0050                DO 160 I=1,5
ISN 0051                YTITLE(I)=YJVER(I)
ISN 0052           160  CONTINUE
ISN 0053                RETURN
ISN 0054           170  DO 180 I=1,8
ISN 0055                ATITLE(I)=SIG(I)
ISN 0056           180  CONTINUE
ISN 0057                DO 190 I=1,5
ISN 0058                YTITLE(I)=YSIG(I)
ISN 0059           190  CONTINUE
ISN 0060                RETURN
ISN 0061           200  CONTINUE
ISN 0062                DO 210 I=1,8
ISN 0063                ATITLE(I)=FOUR(I)
ISN 0064           210  CONTINUE
ISN 0065                DO 220 I=1,4
ISN 0066                XTITLE(I)=XFOUR(I)
ISN 0067           220  CONTINUE
ISN 0068                IF(IDENT.EQ.1.OR.IDENT.EQ.2) GO TO 235
ISN 0070                DO 237 I=1,5
ISN 0071                YTITLE(I)=YFOR(I)
ISN 0072           237  CONTINUE
ISN 0073                RETURN
ISN 0074           235  CONTINUE
ISN 0075                DO 230 I=1,5
ISN 0076                YTITLE(I)=YFOUR(I)
ISN 0077           230  CONTINUE
ISN 0078                RETURN
ISN 0079           240  CONTINUE
ISN 0080                DO 250 I=1,5
ISN 0081                YTITLE(I)=YDER(I)
ISN 0082           250  CONTINUE
ISN 0083                DO 260 I=1,8
ISN 0084                ATITLE(I)=DRIV(I)
ISN 0085           260  CONTINUE
ISN 0086                RETURN
ISN 0087                END
```

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

41

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.22   PAGE 1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

                   FUNCTIONS INLINE ARE: ACNE

```
ISN 0002              SUBROUTINE FLINE(SUM,W,T,Y,NT)
ISN 0003              DIMENSION T(1),Y(1)
ISN 0004              COMPLEX AA,AB,AC,F3,F4,SUM
ISN 0005              SUM=(0.,0.,0.)
ISN 0006              IF(W.EQ.0.01 GO TO 101
ISN 0008              AA=1.0
ISN 0009              IF(ABS(W*T(1)).GE.8.231E+5)  GO TO 10
ISN 0011              AA=CMPLX(COS(W*T(1)),-SIN(W*T(1)))
ISN 0012      10      CONTINUE
ISN 0013              DO 100 I=2,NT
ISN 0014              DT=T(I)-T(I-1)
ISN 0015              AB=1.0
ISN 0016              IF(ABS(W*T(1)).GE.8.231E+5) GO TO 20
ISN 0018              AB=CMPLX(COS(W*T(I)),-SIN(W*T(I)))
ISN 0019      20      CONTINUE
ISN 0020              WDT=W*DT
C    THE BREAKPOINT BETWEEN LARGE- AND SMALL-ARGUMENTS SHOULE BE 1.0E-N,
C    WHERE N=(D-4)/8, WHERE D = NUMBER OF DIGITS CARRIED BY THE COMPUTER.
C    THE AMPLITUDE ACCURACY CF THE LARGE ARGUMENT PROCEDURE IS D-2N DIGITS
C    AND OF THE SMALL-ARGUMENT PROCECURE IS 6N+4 DIGITS.
ISN 0021              IF(ABS(WDT).GT.5.0E-2) GO TO 50
ISN 0023              G=WDT**2
ISN 0024              AC= G  +(CMPLX(0.5,-(1.0/3.C)*WDT)+G*(CMPLX(-0.125,(1.0/30.0)*WDT
                     *)+G*CMPLX((1.0/144.0),-(1.0/840.0)*WDT)))
ISN 0025              F3=CONJG(AC)*AB
ISN 0026              F4=AC*AA
ISN 0027              GO TO 60
ISN 0028      50      AC=CMPLX(1.0,WDT)
ISN 0029              F4=AC*AB-AA
ISN 0030              F3=CONJG(AC)*AA-AB
ISN 0031      60      SUM=SUM+(F3*Y(I-1)+F4*Y(I))/(WDT*W)
ISN 0032      100     AA=AB
ISN 0033              RETURN
ISN 0034      101     DO 102 J=2,NT
ISN 0035      102     SUM=SUM+0.5*(Y(J-1)+Y(J))*(T(J)-T(J-1))
ISN 0036              RETURN
ISN 0037              END
```

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NCNE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   36, PROGRAM SIZE =   1876, SUBPROGRAM NAME = FLINE

STATISTICS NC DIAGNOSTICS GENERATED

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   CS/360   FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.24   PAGE 1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I))

        FUNCTIONS INLINE ARE: NONE

ISN 0002   SUBROUTINE A1A3(A1,A3,C1)
ISN 0003   REAL K1,K2
ISN 0004   COMMON/B/ T(500),F(500),ALPHA,BETA,IT(5000),FF(5000),
                          DF(500),DFF(5000)
ISN 0005   COMMON/J/ALFA,BET,AL,BE,LA1,LA2
ISN 0006   DF2=F(3)-F(2)
ISN 0007   DT2=T(3)-T(2)
ISN 0008   DT1=T(2)-T(3)
ISN 0009   K1=DF2/DT2+.5*(BN(2)+BN(3))+DT1-ALPHA*F(2)
ISN 0010   K2=BN(2)+BN(3)-(ALPHA**2)+F(2)
ISN 0011   ARG1=2.*ALPHA*T(2)
ISN 0012   AL=ALPHA
ISN 0013   IF(ABS(ARG1).LT.174.) GO TO 10
ISN 0015   ALFA=174./(2.*T(2))
ISN 0016   LA1=1
ISN 0017   ALPHA=ALFA
ISN 0018   10 ARG1=2.*ALPHA*T(2)
ISN 0019   ARG2=-ALPHA*T(2)
ISN 0020   EXA2=EXP(ARG1)
ISN 0021   EXA=EXP(ARG2)
ISN 0022   A3=(K1+K2*DT2/6.)/((ALPHA**2)+DT2/2.+ALPHA)*EXA2)
ISN 0023   A1=(F12)-A3+EXA2)*EXA
ISN 0024   RNUM=K1+K2*DT2/6.
ISN 0025   RDENOM=((ALPHA**2)+DT2/2.,)*ALPHA
ISN 0026   C1=(K2-3.*(ALPHA**2)+(RNUM/RDENOM))/(6.*(DT2**2))
ISN 0027   RETURN
ISN 0028   END

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I))

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS SOURCE STATEMENTS =   27, PROGRAM SIZE =   992, SUBPROGRAM NAME = A1A3

STATISTICS NO DIAGNOSTICS GENERATED

*****END OF COMPILATION *****   212K BYTES OF CODE NOT USED

43

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360   FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.26   PAGE 1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

                   FUNCTIONS INLINE ARE: NONE

ISN 0002   SUBROUTINE A2A4(A2,A4,DNN)
ISN 0003   REAL K3,K4
ISN 0004   COMMON/B/ T(500),F(500),ALPHA,BETA,TT(500),FF(500),
                 ,   DF(500),DFF(500)
ISN 0005   COMMON/C/ TMAX,TCUT,NPTS,MPTS,IPTS,MAXPTS,DPTS,ICUT
ISN 0006   COMMON/J/ALFA,BET,AL,BE,LA1,LA2
ISN 0007   DFN=F(NPTS)-F(NPTS-1)
ISN 0008   DTN=T(NPTS)-T(NPTS-1)
ISN 0009   K3=-DFN/DTN-.5*(BN(NPTS)+BN(NPTS-1))*DTN-BETA*F(NPTS)
ISN 0010   K4=(BETA**2)*F(NPTS)-(BN(NPTS)+BN(NPTS-1))
ISN 0011   BE=BETA
ISN 0012   ARG1=-2.*BETA*T(NPTS)
ISN 0013   IF(ABS(ARG1).LT.174.) GO TO 10
ISN 0015   LA2=1
ISN 0016   BET=174./(-2.*T(NPTS))
ISN 0017   BETA=BET
ISN 0018   10 ARG1=-2.*BETA*T(NPTS)
ISN 0019   ARG2=BETA*T(NPTS)
ISN 0020   EXB2=EXP(ARG1)
ISN 0021   EXB=EXP(ARG2)
ISN 0022   A4=(K3-K4*DTN/6.)/((BETA+(BETA**2)*DTN/2.)*EXB2)
ISN 0023   A2=(F(NPTS)-A4*EXB2)*EXB
ISN 0024   RNUM=K3-K4*DTN/6.
ISN 0025   RDENOM=BETA+(BETA**2)*DTN/2.
ISN 0026   DNN=(K4*3.*(BETA**2)*(RNUM/RCENOM))/(6.*(DTN**2))
ISN 0027   RETURN
ISN 0028   END

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   27, PROGRAM SIZE =   1182, SUBPROGRAM NAME = A2A4

STATISTICS NO DIAGNOSTICS GENERATED

******* END OF COMPILATION *******   212K BYTES OF CORE NOT USED

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360   FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.28   PAGE   1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

FUNCTIONS INLINE ARE: NONE

```
ISN 0002        FUNCTION BN(I)
ISN 0003        COMMON/B/ T(500),F(500),ALPHA,BETA,TT(500),FF(500),
               . DF(500),DFF(500)
ISN 0004        COMMON/C/ TMAX,TCUT,NPTS,MPTS,IPTS,MAXPTS,OPTS,ICUT
ISN 0005        IF(I.NE.2)  GO TO 10
ISN 0007        DF2=F(3)-F(2)
ISN 0008        DT2=T(3)-T(2)
ISN 0009        D2=DF2/DT2
ISN 0010        BN=(D1-ALPHA*F(2))*(1./DT2)
ISN 0011        RETURN
ISN 0012     10 IF(I.NE.NPTS)  GO TO 20
ISN 0014        DFN=F(NPTS)-F(NPTS-1)
ISN 0015        DTN=T(NPTS)-T(NPTS-1)
ISN 0016        D2=DFN/DTN
ISN 0017        BN=(-BETA*F(NPTS)-D2)*(1./DTN)
ISN 0018        RETURN
ISN 0019     20 DFP=F(I+1)-F(I)
ISN 0020        FD=F(I)-F(I-1)
ISN 0021        DTP=T(I+1)-T(I)
ISN 0022        DT=T(I)-T(I-1)
ISN 0023        BN=(DFP/DTP-FD/DT)*(1./(T(I+1)-T(I-1)))
ISN 0024        RETURN
ISN 0025        END
```

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK CBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS SOURCE STATEMENTS =   24, PROGRAM SIZE =   834, SUBPROGRAM NAME =   BN

STATISTICS NO DIAGNOSTICS GENERATED

******END OF COMPILATION ******   212K BYTES OF CORE NOT USED

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.30   PAGE 1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

FUNCTIONS INLINE ARE: NONE

```
ISN 0002          FUNCTION CN(J)
ISN 0003          COMMON/B/ T(500),F(5C0),ALPHA,BETA,TT(5000),FF(5000),
       .               DF(500),DFF(5000)
ISN 0004          COMMON/C/ TMAX,TCUT,NPTS,MPTS,IPTS,MAXPTS,OPTS,ICUT
ISN 0005          COMMON/E/ A1,A2,A3,A4,C1,CNM1,D2,DNN
ISN 0006          IF(J.EQ.2) GO TO 10
ISN 0008          DTN=T(J)-T(J-1)
ISN 0009          DTP1=T(J+1)-T(J)
ISN 0010          DTP2=T(J+1)-T(J-1)
ISN 0011          CN=(-DELF1(J)+DELF2(J)*DTN/6.)/((DTP1**2)*DTP2)
ISN 0012          IF(J.NE.NPTS-1) RETURN
ISN 0014          CNM1=CN
ISN 0015          RETURN
ISN 0016       10 CN=C1
ISN 0017          RETURN
ISN 0018          END
```

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT   FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   17, PROGRAM SIZE =   562, SUBPROGRAM NAME =   CN

STATISTICS NO DIAGNOSTICS GENERATED

******* END OF COMPILATION *******

212K BYTES OF CORE NOT USED

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.31   PAGE   1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST AGDECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

                   FUNCTIONS INLINE ARE: NONE

ISN 0002   FUNCTION DN(J)
ISN 0003   COMMON/B/ T(500),F(500),ALPHA,BETA,TT(5000),FF(5000),
                 .   DF(500),DFF(500)
ISN 0004   COMMON/A1,A2,A3,A4,C1,CAM1,D2,DNN
ISN 0005   DTN=T(J)-T(J-1)
ISN 0006   DTP2=T(J+1)-T(J-1)
ISN 0007   DN=(-DELF1(J)-DELF2(J)*DTN/6.)/(6(DTN**2)*DTP2)
ISN 0008   IF(J.NE.3) RETURN
ISN 0010   D2=DN
ISN 0011   RETURN
ISN 0012   END

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   11, PROGRAM SIZE =   466, SUBPROGRAM NAME =   DN

STATISTICS NO DIAGNOSTICS GENERATED

*****END OF COMPILATION ******   212K BYTES OF CORE NOT USED

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.33   PAGE 1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(05COK) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

                   FUNCTIONS INLINE ARE: NONE

ISN 0002   FUNCTION DELF1(J)
ISN 0003   COMMON/B/ T(500),F(500),ALPHA,BETA,TT(5000),FF(5000),
                 , DF(500),DFF(5000)

ISN 0004   DFP1=F(J+1)-F(J)
ISN 0005   DFN=F(J)-F(J-1)
ISN 0006   DTP1=T(J+1)-T(J)
ISN 0007   DTN=T(J)-T(J-1)
ISN 0008   R1=-.5*(BN(J)+BN(J+1))*DTP1
ISN 0009   R2=.5*(BN(J)+BN(J-1))*DTN
ISN 0010   DELF1=DFP1/DTP1-DFN/DTN-R1-R2
ISN 0011   RETURN
ISN 0012   END

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(05COK) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   11, PROGRAM SIZE =   584, SUBPROGRAM NAME = DELF1

STATISTICS NO DIAGNOSTICS GENERATED

****** END OF COMPILATION ******   212K BYTES OF CORE NOT USED

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

CS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.35   PAGE   1

LEVEL 2.2 (SEPT 76)

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

                   FUNCTIONS INLINE ARE: NONE

ISN 0002   FUNCTION DELF2(J)
ISN 0003   DELF2=BN(J+1)-BN(J-1)
ISN 0004   RETURN
ISN 0005   END

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   4, PROGRAM SIZE =   306, SUBPROGRAM NAME = DELF2

STATISTICS NO DIAGNOSTICS GENERATED

******* END OF COMPILATION *******   222K BYTES OF CORE NOT USED

49

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.36   PAGE   1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP MOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

        FUNCTIONS INLINE ARE: NONE

ISN 0002   SUBROUTINE ENTITL(IZ,XLAB,YLAB,PLAB)
ISN 0003   INTEGER XTITLE,YTITLE,ATITLE
ISN 0004   INTEGER XLAB,YLAB,PLAB
ISN 0005   COMMON/I/ XTITLE(10),YTITLE(10),ATITLE(10)
ISN 0006   DIMENSION XLAB(10),YLAB(10),PLAB(10)
ISN 0007   IF(IZ.EQ.0) GO TO 40
ISN 0009   READ(5,10) (XTITLE(I),I=1,3)
ISN 0010   10 FORMAT(3A4)
ISN 0011   READ(5,20) (YTITLE(I),I=1,5)
ISN 0012   20 FORMAT(5A4)
ISN 0013   READ(5,30) (ATITLE(I),I=1,10)
ISN 0014   30 FORMAT(10A4)
ISN 0015   RETURN
ISN 0016   40 CONTINUE
ISN 0017   DO 50 I=1,3
ISN 0018   50 XLAB(I)=XTITLE(I)
ISN 0019   DO 60 I=1,5
ISN 0020   60 YLAB(I)=YTITLE(I)
ISN 0021   DO 70 I=1,10
ISN 0022   70 PLAB(I)=ATITLE(I)
ISN 0023   RETURN
ISN 0024   END

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP MOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   23, PROGRAM SIZE =   724, SUBPROGRAM NAME =ENTITL

STATISTICS NO DIAGNOSTICS GENERATED

******* END OF COMPILATION *******   212K BYTES OF CORE NOT USED

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360   FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.38   PAGE   1

REQUESTED OPTIONS: SOURCE,NCMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NCALC NOANSF NOTERM FLAG(I)

        FUNCTIONS INLINE ARE: NCNE

```
                SUBROUTINE PERFIL
                INTEGER TITLE
ISN 0002        COMMON/A/ ORDMIN,IDENT,IFFT,TITLE(20),IPLOT,ILNLOG
ISN 0003        COMMON/B/ T(500),F(500),ALPHA,BETA,TT(500),FF(500),
ISN 0004      .           DF(500),DFF(500)
ISN 0005        COMMON/C/ TMAX,TCUT,NPTS,MPTS,IPTS,MAXPTS,OPTS,ICUT
                COMMON/H/ IOT
ISN 0006        COMMON/K/ TX(100),FY(100),IREAD,IDELET,IADD,NIADD,NSETS,NUM(8)
ISN 0007        DIMENSION ATITLE(1C),XTITLE(10),YTITLE(10)
ISN 0008        DATA BLANK/4H   /
ISN 0009        IF(IOT.EQ.1)  GO TC 5
ISN 0010        CALL ANOTAT(XTITLE,YTITLE,ATITLE,0)
ISN 0011        GO TO 7
ISN 0013      5 CALL ENTITL(0,XTITLE,YTITLE,ATITLE)
ISN 0014      7 IF(NSETS.EQ.0) NSETS=1
ISN 0015        CALL READPF(12,NSETS,T,F,JPTS)
ISN 0016
ISN 0018    C
            C   WRITE DATA POINTS THAT WERE ON PERMANENT FILE
            C
ISN 0019        WRITE(6,10)
ISN 0020     10 FORMAT(1H1)
ISN 0021        WRITE(6,20) (ATITLE(I),I=1,1C)
ISN 0022     20 FORMAT(/,/,1X,10A4)
ISN 0023        WRITE(6,30) (TITLE(I),I=1,20)
ISN 0024     30 FORMAT(5X,20A4,/,/)
ISN 0025        WRITE(6,40) (XTITLE(I),I=1,2,3),(YTITLE(I),I=1,3),(XTITLE(I),
               .I=1,3),(YTITLE(I),I=1,3),(XTITLE(I),I=1,3),(YTITLE(I),I=1,3)
ISN 0026     40 FORMAT(/,/,13X,2A4,A2,4X,3A4,2X1CX,2A4,A2,4X,3A4)
ISN 0027        CALL COLMNS(2,JPTS,T,F)
            C
            C   DELETE SPECIFIED POINTS
            C
ISN 0028        IF(IDELET.EQ.0)  GC TO 60
ISN 0030        J=1
            C
            C   IDENTIFY POINTS TO BE SCRATCHED
            C
ISN 0031        DO 50 I=1,JPTS
ISN 0032        IF(I.EQ.NUM(J))  T(I)=BLANK
ISN 0034        IF(I.EQ.NUM(J))  J=J+1
ISN 0036     50 CONTINUE
            C
            C   DELETE POINTS
            C
ISN 0037        K=1
ISN 0038        DO 70 I=1,JPTS
ISN 0039        IF(T(I).EQ.BLANK)  GC TO 60
ISN 0041        T(K)=T(I)
ISN 0042        F(K)=F(I)
ISN 0043        K=K+1
```

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2   (SEPT 76)   PERFIL   OS/360   FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.38   PAGE 2

```
ISN 0044          60   IF(F(I).EQ.JPTS.AND.T(I).EQ.BLANK) K=K+1
ISN 0046          70   CONTINUE
ISN 0047               JPTS=K-1
                  C
                  C      ADD SPECIFIED POINTS
                  C
ISN 0048          80   IF(IADD.EQ.0) GO TO 130
ISN 0050               K=1
ISN 0051               DO 120 J=1,NIADD
ISN 0052               DO 110 J=1,JPTS
ISN 0053               T(K)=T(J)
ISN 0054               F(K)=F(J)
ISN 0055               IF(TX(I).GE.T(J).AND.TX(I).LE.T(J+1)) GO TO 90
ISN 0057               IF(J.EQ.JPTS.AND.TX(I).GE.T(JPTS)) GO TO 90
ISN 0059               GO TO 100
ISN 0060          90   K=K+1
ISN 0061               T(K)=TX(I)
ISN 0062               F(K)=FY(I)
ISN 0063         100   K=K+1
ISN 0064         110   CONTINUE
ISN 0065               JPTS=K-1
ISN 0066         120   CONTINUE
                  C
                  C      DELETE FIRST POINT IF TIME OR AMPLITUDE EQUAL TO ZERO
                  C
ISN 0067         130   IF(T(1).NE.0..AND.F(1).NE.0.) GO TO 150
ISN 0069               DO 140 I=2,JPTS
ISN 0070               T(I-1)=T(I)
ISN 0071               F(I-1)=F(I)
ISN 0072         140   CONTINUE
ISN 0073               JPTS=JPTS-1
ISN 0074         150   CONTINUE
ISN 0075               DO 200 I=1,JPTS
ISN 0076               K=JPTS+2-I
ISN 0077               T(K)=T(K-1)
ISN 0078               F(K)=F(K-1)
ISN 0079         200   CONTINUE
ISN 0080               IPTS=JPTS
ISN 0081               NPTS=JPTS+1
ISN 0082               RETURN
ISN 0083               END
```

APPENDIX A

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

CS/360   FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.41   PAGE 1

LEVEL 2.2 (SEPT 76)

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC BCANSF NOTERM FLAG(I)

FUNCTIONS INLINE ARE: NONE

```
ISN 0002        SUBROUTINE DERIV
ISN 0003        COMMON/B/ T(500),F(500),ALPHA,BETA,TT(5000),FF(5000),
               1          DF(500),DFF(5000)
ISN 0004        COMMON/C/ TMAX,TCUT,APTS,MPTS,IPTS,MAXPTS,OPTS,ICUT
ISN 0005        COMMON/E/ A1,A2,A3,A4,C1,CNM1,D2,DNN
ISN 0006        COMMON/H/ IQT,IFPRIM,IPERM,IFPPIT
ISN 0007        COMMON/K/ TX(100),FY(100),IREAD,IDELET,IADD,NIADD,NSETS,NUM(8)
ISN 0008        DF(1)=0.
ISN 0009        DFF(1)=0.
ISN 0010        IF(IFPRIM.EQ.2) GO TO 40
ISN 0012        DO 30 I=2,NPTS
ISN 0013        IF(T(I).NE.T(2))  GO TO 10
ISN 0015        DF(I)=ALPHA*(F(I)+A3*EXP(2.*ALPHA*T(I)))
ISN 0016        GO TO 30
ISN 0017     10 IF(T(I).NE.T(NPTS)) GO TO 20
ISN 0019        DF(I)=BETA*(F(I)+A4*EXP(-2.*BETA*T(I)))
ISN 0020        GO TO 30
ISN 0021     20 FT=(F(I)-F(I-1))/(T(I)-T(I-1))
ISN 0022        BT=T(I)-T(I-1)
ISN 0023        DT=-(T(I)-T(I-1))**3
ISN 0024        DF(I)=FT+.5*(BN(I-1)+BN(I))*BT+DN(I)*DT
ISN 0025     30 CONTINUE
ISN 0026        RETURN
ISN 0027     40 CONTINUE
ISN 0028        I=2
ISN 0029        J=2
ISN 0030     50 CONTINUE
ISN 0031        IF(TT(I).GT.T(J))  J=J+1
ISN 0033        IF(TT(I).GT.T(2))  GO TO 60
ISN 0035        DFF(I)=ALPHA*(FF(I)+A3*EXP(2.*ALPHA*TT(I)))
ISN 0036        I=I+1
ISN 0037        GO TO 50
ISN 0038     60 IF(TT(I).LT.T(NPTS)) GO TO 70
ISN 0040        DFF(I)=-BETA*(FF(I)+A4*EXP(-2.*BETA*TT(I)))
ISN 0041        IF(TT(I).GE.TMAX)  GO TO 100
ISN 0043        I=I+1
ISN 0044        GO TO 50
ISN 0045     70 FT=(F(J)-F(J-1))/(T(J)-T(J-1))
ISN 0046        BT=T(J)-T(J-1)+T(J)-T(J-2)
ISN 0047        CT=(T(J)-TT(I)-T(J-1))**3-3.*(TT(J)-T(J-1))*(T(J)-TT(I))**2
ISN 0048        DT=-(TT(I)-T(J-1))**3-3.*(TT(J)-T(J-1))*(TT(I)-T(J-1))**2
ISN 0049        IF(J.NE.NPTS)  GO TO 80
ISN 0051        CALL A2A4(U,V,D)
ISN 0052        GO TO 90
ISN 0053     80 D=DN(J)
ISN 0054     90 DFF(I)=FT+.5*(BN(J-1)+BN(J))*BT+CN(J-1)*CT+D*DT
ISN 0055        I=I+1
ISN 0056        GO TO 50
ISN 0057    100 RETURN
ISN 0058        END
```

53

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   CS/360   FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.43   PAGE   1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

                   FUNCTIONS INLINE ARE: NONE

```
ISN 0002              SUBROUTINE RITDAT
ISN 0003              INTEGER TITLE
ISN 0004              COMMON/A/ ORDMIN,IDENT,IFFT,TITLE(20),IPLOT,ILNLOG
ISN 0005              COMMON/B/ T(500),F(500),ALPHA,BETA,TT(5000),FF(5000),
                     ,         DF(500),DFF(5000)
ISN 0006              COMMON/C/ TMAX,TCUT,NPTS,MPTS,IPTS,MAXPTS,GPTS,ICUT
ISN 0007              COMMON/H/ IOT,IFPRIM,IPERM,IFPPLT
ISN 0008              DIMENSION XTITLE(10),YTITLE(10),ATITLE(10)
ISN 0009              DATA XTITLE/10*4H    /,YTITLE/10*4H    /,ATITLE/10*4H    /
ISN 0010              GO TO (10,60,10),IPERM
ISN 0011       10     CONTINUE
ISN 0012              IF(IOT.EQ.1) GO TO 20
ISN 0014              CALL ANOTAT(XTITLE,YTITLE,ATITLE,2)
ISN 0015              GO TO 30
ISN 0016       20     CALL ENTITL(IO,XTITLE,YTITLE,ATITLE)
ISN 0017       30     IF(IFPRIM.EQ.2) GO TO 40
ISN 0019              CALL WRITPF(11,T,DF,IPTS,ATITLE)
ISN 0020              GO TO 50
ISN 0021       40     CALL WRITPF(11,TT,DFF,MAXPTS,ATITLE)
ISN 0022       50     IF(IPERM.NE.3) RETURN
ISN 0024       60     CONTINUE
ISN 0025              IF(IOT.EQ.1) GO TO 70
ISN 0027              CALL ANOTAT(XTITLE,YTITLE,ATITLE,0)
ISN 0028              GO TO 80
ISN 0029       70     CALL ENTITL(IO,XTITLE,YTITLE,ATITLE)
ISN 0030       80     CALL WRITPF(IO,TT,FF,MAXPTS,ATITLE)
ISN 0031              RETURN
ISN 0032              END
```

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   31, PROGRAM SIZE =   710, SUBPROGRAM NAME =RITDAT

STATISTICS NL DIAGNOSTICS GENERATED

****** END OF COMPILATION ******   208K BYTES OF CORE NOT USED

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.44   PAGE   1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(OSCOK) AUTODBL(NONE)
SOURCE EBCDIC NODECK NOLIST OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

FUNCTIONS INLINE ARE: NONE

```
ISN 0002       SUBROUTINE READPF(NT,NSETS,X,Y,JPTS)
ISN 0003       DIMENSION X(JPTS),Y(JPTS)
ISN 0004       DO 10 J=1,NSETS
ISN 0005       READ (NT) N1,N2,JPTS,(X(I),A,I=1,JPTS),(Y(I),B,I=1,JPTS)
ISN 0006    10 CONTINUE
ISN 0007       RETURN
ISN 0008       END
```

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(OSCOK) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   7, PROGRAM SIZE =   540, SUBPROGRAM NAME =READPF

STATISTICS NO DIAGNOSTICS GENERATED

******* END OF COMPILATION *******   212K BYTES OF CORE NOT USED

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

ES/360   FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.47   PAGE   1

LEVEL 2.2 (SEPT 76)

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

                   FUNCTIONS INLINE ARE: NONE

ISN 0002   SUBROUTINE WRITPF(NT,X,Y,NPTS,ATITLE)
ISN 0003   DIMENSION X(NPTS),Y(NPTS),ATITLE(10)
ISN 0004   WRITE(NT) ATITLE
ISN 0005   WRITE(NT) NPTS
ISN 0006   WRITE(NT) X,Y
ISN 0007   RETURN
ISN 0008   END

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   7, PROGRAM SIZE =   446, SUBPROGRAM NAME =WRITPF

STATISTICS NO DIAGNOSTICS GENERATED

******* END OF COMPILATION *******   212K BYTES OF CORE NOT USED

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   CS/360 FORTRAN H EXTENDED PLUS   CATE 77.325/14.19.49   PAGE 1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK CBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

                   FUNCTIONS INLINE ARE: NONE

ISN 0002   SUBROUTINE CUTOFF
ISN 0003   COMMON/B/ T(500),F(500),ALPHA,BETA,TT(500),FF(500),
               .   DF(500),DFF(500)
ISN 0004   COMMON/C/ TMAX,TCUT,NPTS,MPTS,IPTS,MAXPTS,OPTS,ICUT
ISN 0005   DO 10 I=2,NPTS
ISN 0006   IF(T(I).GE.TCUT) GO TC 20
ISN 0008   10 CONTINUE
ISN 0009   20 NPTS=I
ISN 0010   IPTS=NPTS-1
ISN 0011   RETURN
ISN 0012   END

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   11, PROGRAM SIZE =   284, SUBPROGRAM NAME =CUTOFF

STATISTICS NO DIAGNOSTICS GENERATED

******* END OF COMPILATION *******   212K BYTES OF CORE NCT USED

57

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

LEVEL 2.2 (SEPT 76)   OS/360 FORTRAN H EXTENDED PLUS   DATE 77.325/14.19.51   PAGE   1

REQUESTED OPTIONS: SOURCE,NOMAP,NOXREF,OPT(0)

OPTIONS IN EFFECT: NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)
                   SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

                   FUNCTIONS INLINE ARE: NONE

ISN 0002   BLOCK DATA
ISN 0003   INTEGER TITLE
ISN 0004   COMMON/A/IDENT,IFFT,TITLE(20),IPLOT,ILMLOG,ORDMIN
ISN 0005   COMMON/J/ALFA,BET,AL,BE,LA1,LA2
ISN 0006   DATA TITLE/20*1H /,LA1/0/,LA2/0/,
ISN 0007   END

*OPTIONS IN EFFECT*NAME(MAIN) NOOPTIMIZE LINECOUNT(60) SIZE(0500K) AUTODBL(NONE)

*OPTIONS IN EFFECT*SOURCE EBCDIC NOLIST NODECK OBJECT NOMAP NOFORMAT NOGOSTMT NOXREF NOALC NOANSF NOTERM FLAG(I)

OPTIONS IN EFFECT FUNCTIONS INLINE ARE: NONE

OPTIONS IN EFFECT

STATISTICS   SOURCE STATEMENTS =   6, PROGRAM SIZE =   0, SUBPROGRAM NAME =   A

STATISTICS NO DIAGNOSTICS GENERATED

******* END OF COMPILATION *******   212K BYTES OF CORE NOT USED

STATISTICS NL DIAGNOSTICS THIS STEP

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

NEMP PROBLEM A   OBSERVER 1

INPUT DATA - ELECTRIC FIELD STRENGTH-RADIAL

ALPHA= 1.200E+08   BETA= 5.000E+04   MAXIMUM TIME TO BE CALCULATED= 5.000E-04
NUMBER OF INPUT DATA POINTS= 221   NUMBER OF POINTS CALCULATED BETWEEN INPUT DATA POINTS= 1
CUTOFF TIME EMPLOYED= 3.000E-04

TIME (SEC)	E-RADIAL	TIME (SEC)	E-RADIAL	TIME (SEC)	E-RADIAL
1.038E-08	1.055E+00	2.330E-07	2.360E+03	7.537E-06	-2.294E+02
1.269E-08	9.021E+00	2.431E-07	2.303E+03	8.058E-06	-1.866E+02
1.481E-08	2.977E+01	2.538E-07	2.245E+03	8.578E-06	-1.372E+02
1.705E-08	6.791E+01	2.651E-07	2.186E+03	9.134E-06	-1.070E+02
1.948E-08	1.255E+02	2.769E-07	2.126E+03	9.723E-06	-8.248E+01
2.191E-08	1.911E+02	2.891E-07	2.067E+03	1.035E-05	-7.351E+01
2.406E-08	2.479E+02	3.022E-07	2.006E+03	1.101E-05	-8.732E+01
2.656E-08	3.032E+02	3.156E-07	1.947E+03	1.167E-05	-8.124E+01
2.843E-08	3.393E+02	3.298E-07	1.888E+03	1.240E-05	-6.684E+01
3.043E-08	3.796E+02	3.442E-07	1.831E+03	1.312E-05	-7.135E+01
3.133E-08	4.011E+02	3.594E-07	1.774E+03	1.392E-05	-6.603E+01
3.214E-08	4.239E+02	3.745E-07	1.720E+03	1.472E-05	-7.080E+01
3.287E-08	4.476E+02	3.987E-07	1.640E+03	1.559E-05	-6.802E+01
3.353E-08	4.723E+02	4.150E-07	1.590E+03	1.646E-05	-6.029E+01
3.412E-08	4.978E+02	4.316E-07	1.541E+03	1.739E-05	-5.069E+01
3.465E-08	5.238E+02	4.491E-07	1.491E+03	1.840E-05	-4.333E+01
3.513E-08	5.499E+02	4.752E-07	1.420E+03	1.940E-05	-4.064E+01
3.556E-08	5.755E+02	4.926E-07	1.375E+03	2.048E-05	-3.962E+01
3.595E-08	6.004E+02	5.205E-07	1.304E+03	2.159E-05	-3.966E+01
3.630E-08	6.242E+02	5.392E-07	1.258E+03	2.277E-05	-3.859E+01
3.661E-08	6.465E+02	5.677E-07	1.190E+03	2.402E-05	-3.551E+01
3.689E-08	6.673E+02	5.877E-07	1.143E+03	2.530E-05	-3.206E+01
3.715E-08	6.863E+02	6.178E-07	1.074E+03	2.666E-05	-2.865E+01
3.737E-08	7.037E+02	6.484E-07	1.005E+03	2.808E-05	-2.700E+01
3.758E-08	7.196E+02	6.807E-07	9.343E+02	2.954E-05	-2.417E+01
3.778E-08	7.350E+02	7.129E-07	8.653E+02	3.110E-05	-2.087E+01
3.818E-08	7.656E+02	7.457E-07	7.970E+02	3.273E-05	-2.067E+01
3.858E-08	7.957E+02	7.803E-07	7.268E+02	3.443E-05	-2.281E+01
3.898E-08	8.249E+02	8.149E-07	6.586E+02	3.620E-05	-2.101E+01
3.938E-08	8.533E+02	8.501E-07	5.917E+02	3.807E-05	-1.727E+01
3.998E-08	8.946E+02	8.872E-07	5.233E+02	4.002E-05	-1.507E+01
4.039E-08	9.216E+02	9.244E-07	4.576E+02	4.206E-05	-1.427E+01
4.189E-08	1.010E+03	9.745E-07	3.738E+02	4.427E-05	-1.333E+01
4.316E-08	1.067E+03	1.014E-06	3.111E+02	4.647E-05	-1.414E+01
4.515E-08	1.134E+03	1.067E-06	2.333E+02	4.880E-05	-1.196E+01
4.659E-08	1.176E+03	1.121E-06	1.621E+02	5.126E-05	-9.675E+00
4.827E-08	1.219E+03	1.164E-06	1.110E+02	5.383E-05	-1.071E+01
5.020E-08	1.261E+03	1.221E-06	5.035E+01	5.653E-05	-1.012E+01
5.245E-08	1.301E+03	1.278E-06	-1.371E+00	5.938E-05	-9.779E+00
5.413E-08	1.329E+03	1.339E-06	-4.635E+01	6.233E-05	-7.894E+00
5.599E-08	1.374E+03	1.400E-06	-8.244E+01	6.542E-05	-8.788E+00
5.804E-08	1.413E+03	1.461E-06	-1.096E+02	6.865E-05	-7.764E+00
6.031E-08	1.561E+03	1.526E-06	-1.292E+02	7.205E-05	-7.100E+00
6.280E-08	1.474E+03	1.608E-06	-1.438E+02	7.562E-05	-6.539E+00
6.555E-08	1.689E+03	1.673E-06	-1.487E+02	7.933E-05	-6.533E+00
6.858E-08	1.839E+03	1.756E-06	-1.485E+02	8.322E-05	-5.613E+00

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

7.192E-08	1.927E+03	1.838E-06	-1.450E+02	8.731E-05	-5.519E+00
7.372E-08	2.008E+03	1.921E-06	-1.403E+02	9.158E-05	-5.141E+00
7.759E-08	2.153E+03	2.020E-06	-1.348E+02	9.606E-05	-4.949E+00
7.967E-08	2.205E+03	2.102E-06	-1.324E+02	1.007E-04	-4.508E+00
8.414E-08	2.359E+03	2.201E-06	-1.322E+02	1.057E-04	-4.094E+00
8.644E-08	2.400E+03	2.317E-06	-1.337E+02	1.108E-04	-4.479E+00
9.104E-08	2.395E+03	2.416E-06	-1.361E+02	1.218E-04	-3.623E+00
9.334E-08	2.458E+03	2.531E-06	-1.378E+02	1.277E-04	-3.594E+00
9.794E-08	2.623E+03	2.647E-06	-1.366E+02	1.339E-04	-3.071E+00
1.025E-07	2.604E+03	2.779E-06	-1.331E+02	1.403E-04	-2.922E+00
1.071E-07	2.653E+03	2.911E-06	-1.295E+02	1.472E-04	-2.587E+00
1.117E-07	2.704E+03	3.043E-06	-1.289E+02	1.542E-04	-2.265E+00
1.163E-07	2.702E+03	3.192E-06	-1.360E+02	1.616E-04	-2.116E+00
1.212E-07	2.732E+03	3.340E-06	-1.512E+02	1.695E-04	-1.884E+00
1.263E-07	2.775E+03	3.489E-06	-1.706E+02	1.776E-04	-1.672E+00
1.315E-07	2.785E+03	3.654E-06	-1.916E+02	1.861E-04	-1.452E+00
1.372E-07	2.751E+03	3.819E-06	-2.059E+02	1.950E-04	-1.357E+00
1.430E-07	2.749E+03	4.000E-06	-2.116E+02	2.044E-04	-1.182E+00
1.491E-07	2.759E+03	4.198E-06	-2.104E+02	2.141E-04	-1.018E+00
1.555E-07	2.748E+03	4.396E-06	-2.025E+02	2.244E-04	-8.523E-01
1.622E-07	2.724E+03	4.594E-06	-1.811E+02	2.351E-04	-7.839E-01
1.692E-07	2.690E+03	4.809E-06	-1.340E+02	2.464E-04	-6.434E-01
1.766E-07	2.655E+03	5.040E-06	-5.880E+01	2.581E-04	-5.092E-01
1.843E-07	2.620E+03	5.272E-06	-5.934E+01	2.705E-04	-3.832E-01
1.924E-07	2.583E+03	5.698E-06	-2.008E+02	2.834E-04	-2.671E-01
2.050E-07	2.518E+03	6.115E-06	-1.968E+02	2.969E-04	-2.313E-01
2.138E-07	2.468E+03	6.566E-06	-2.892E+02	3.111E-04	-1.254E-01
2.231E-07	2.416E+03	7.052E-06	-2.407E+02		

NUMBER OF POINTS = 221

60

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

CURVE FIT CALCULATIONS

MINIMUM VALUE OF ORDINATE TO BE PLOTTED= -5.000E+05

TIME (SEC)	E-RADIAL	TIME (SEC)	E-RADIAL	TIME (SEC)	E-RADIAL
8.3C4E-09	0.0	2.280E-07	2.388E+03	7.294E-06	-2.336E+02
9.342E-09	8.872E-02	2.330E-07	2.360E+03	7.537E-06	-2.294E+02
1.C38E-08	1.055E+00	2.380E-07	2.331E+03	7.798E-06	-2.109E+02
1.153E-08	3.282E+00	2.431E-07	2.303E+03	8.056E-06	-1.866E+02
1.269E-08	9.021E+00	2.485E-07	2.274E+03	8.318E-06	-1.608E+02
1.375E-08	1.763E+01	2.538E-07	2.245E+03	8.578E-06	-1.372E+02
1.481E-08	2.977E+01	2.595E-07	2.215E+03	8.856E-06	-1.201E+02
1.593E-08	4.686E+01	2.651E-07	2.186E+03	9.134E-06	-1.070E+02
1.705E-06	6.791E+01	2.710E-07	2.156E+03	9.429E-06	-9.338E+01
1.827E-08	9.509E+01	2.769E-07	2.126E+03	9.723E-06	-8.248E+01
1.946E-08	1.255E+02	2.830E-07	2.096E+03	1.004E-05	-7.530E+01
2.070E-08	1.579E+02	2.891E-07	2.067E+03	1.035E-05	-7.351E+01
2.191E-08	1.911E+02	2.956E-07	2.036E+03	1.068E-05	-8.020E+01
2.298E-08	2.201E+02	3.022E-07	2.006E+03	1.101E-05	-8.732E+01
2.406E-08	2.479E+02	3.C89E-07	1.976E+03	1.134E-05	-8.630E+01
2.531E-08	2.768E+02	3.156E-07	1.947E+03	1.167E-05	-8.124E+01
2.656E-08	3.032E+02	3.227E-07	1.917E+03	1.203E-05	-7.315E+01
2.750E-08	3.215E+02	3.298E-07	1.888E+03	1.240E-05	-6.684E+01
2.843E-08	3.393E+02	3.370E-07	1.859E+03	1.276E-05	-6.841E+01
2.943E-08	3.586E+02	3.442E-07	1.831E+03	1.312E-05	-7.133E+01
3.043E-08	3.796E+02	3.518E-07	1.802E+03	1.352E-05	-6.880E+01
3.088E-08	3.899E+02	3.594E-07	1.774E+03	1.392E-05	-6.603E+01
3.133E-08	4.011E+02	3.670E-07	1.747E+03	1.432E-05	-6.812E+01
3.174E-08	4.120E+02	3.745E-07	1.720E+03	1.472E-05	-7.080E+01
3.214E-08	4.239E+02	3.866E-07	1.680E+03	1.515E-05	-7.006E+01
3.251E-08	4.353E+02	3.987E-07	1.640E+03	1.559E-05	-6.802E+01
3.287E-08	4.476E+02	4.069E-07	1.615E+03	1.602E-05	-6.454E+01
3.320E-08	4.595E+02	4.150E-07	1.590E+03	1.646E-05	-6.029E+01
3.353E-08	4.723E+02	4.233E-07	1.565E+03	1.692E-05	-5.539E+01
3.382E-08	4.846E+02	4.316E-07	1.541E+03	1.739E-05	-5.069E+01
3.412E-08	4.978E+02	4.404E-07	1.516E+03	1.790E-05	-4.649E+01
3.439E-06	5.104E+02	4.491E-07	1.491E+03	1.840E-05	-4.333E+01
3.465E-08	5.238E+02	4.621E-07	1.455E+03	1.890E-05	-4.157E+01
3.489E-08	5.365E+02	4.752E-07	1.420E+03	1.940E-05	-4.064E+01
3.513E-08	5.499E+02	4.839E-07	1.397E+03	1.994E-05	-3.995E+01
3.534E-08	5.625E+02	4.926E-07	1.375E+03	2.048E-05	-3.962E+01
3.556E-08	5.755E+02	5.066E-07	1.339E+03	2.104E-05	-3.963E+01
3.575E-08	5.878E+02	5.205E-07	1.304E+03	2.159E-05	-3.966E+01
3.595E-08	6.004E+02	5.298E-07	1.281E+03	2.218E-05	-3.933E+01
3.612E-08	6.121E+02	5.392E-07	1.258E+03	2.277E-05	-3.859E+01
3.630E-08	6.242E+02	5.534E-07	1.224E+03	2.340E-05	-3.720E+01
3.645E-08	6.353E+02	5.677E-07	1.190E+03	2.402E-05	-3.551E+01
3.661E-08	6.465E+02	5.777E-07	1.166E+03	2.466E-05	-3.379E+01
3.675E-08	6.568E+02	5.877E-07	1.143E+03	2.530E-05	-3.206E+01
3.689E-08	6.673E+02	6.028E-07	1.108E+03	2.598E-05	-3.021E+01
3.702E-08	6.768E+02	6.178E-07	1.074E+03	2.666E-05	-2.865E+01
3.715E-08	6.863E+02	6.331E-07	1.039E+03	2.737E-05	-2.777E+01
3.726E-08	6.950E+02	6.484E-07	1.005E+03	2.808E-05	-2.700E+01
3.737E-08	7.037E+02	6.645E-07	9.695E+02	2.881E-05	-2.571E+01

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

3.748E-08	7.116E+02	6.807E-07	9.343E+02	2.954E-05	-2.417E+01
3.758E-08	7.196E+02	6.966E-07	8.995E+02	3.032E-05	-2.234E+01
3.768E-08	7.273E+02	7.129E-07	8.653E+02	3.110E-05	-2.087E+01
3.778E-08	7.350E+02	7.293E-07	8.309E+02	3.191E-05	-2.037E+01
3.798E-08	7.504E+02	7.457E-07	7.970E+02	3.273E-05	-2.067E+01
3.818E-08	7.656E+02	7.630E-07	7.617E+02	3.358E-05	-2.184E+01
3.838E-08	7.807E+02	7.803E-07	7.268E+02	3.443E-05	-2.281E+01
3.858E-08	7.957E+02	7.976E-07	6.925E+02	3.532E-05	-2.233E+01
3.878E-08	8.104E+02	8.149E-07	6.586E+02	3.626E-05	-2.101E+01
3.898E-08	8.249E+02	8.325E-07	6.249E+02	3.714E-05	-1.915E+01
3.918E-08	8.392E+02	8.501E-07	5.917E+02	3.807E-05	-1.727E+01
3.938E-08	8.533E+02	8.687E-07	5.572E+02	3.905E-05	-1.595E+01
3.968E-08	8.742E+02	8.872E-07	5.233E+02	4.002E-05	-1.507E+01
3.998E-08	8.946E+02	9.058E-07	4.901E+02	4.104E-05	-1.459E+01
4.019E-08	9.082E+02	9.244E-07	4.576E+02	4.206E-05	-1.427E+01
4.039E-08	9.216E+02	9.494E-07	4.150E+02	4.314E-05	-1.369E+01
4.114E-08	9.683E+02	9.745E-07	3.738E+02	4.422E-05	-1.333E+01
4.189E-08	1.010E+03	9.944E-07	3.420E+02	4.534E-05	-1.381E+01
4.253E-08	1.041E+03	1.014E-06	3.111E+02	4.647E-05	-1.416E+01
4.316E-08	1.067E+03	1.041E-06	2.713E+02	4.763E-05	-1.328E+01
4.416E-08	1.103E+03	1.067E-06	2.333E+02	4.880E-05	-1.196E+01
4.515E-08	1.134E+03	1.094E-06	1.967E+02	5.003E-05	-1.057E+01
4.587E-08	1.155E+03	1.121E-06	1.621E+02	5.126E-05	-9.675E+00
4.659E-08	1.176E+03	1.142E-06	1.360E+02	5.254E-05	-1.006E+01
4.743E-08	1.198E+03	1.164E-06	1.110E+02	5.383E-05	-1.071E+01
4.827E-08	1.219E+03	1.192E-06	7.961E+01	5.518E-05	-1.053E+01
4.924E-08	1.241E+03	1.221E-06	5.035E+01	5.653E-05	-1.012E+01
5.020E-08	1.261E+03	1.249E-06	2.334E+01	5.796E-05	-1.003E+01
5.132E-08	1.282E+03	1.278E-06	-1.371E+00	5.938E-05	-9.779E+00
5.245E-08	1.301E+03	1.308E-06	-2.509E+01	6.085E-05	-8.754E+00
5.329E-08	1.315E+03	1.339E-06	-4.635E+01	6.233E-05	-7.894E+00
5.413E-08	1.329E+03	1.369E-06	-6.552E+01	6.387E-05	-8.255E+00
5.506E-08	1.352E+03	1.400E-06	-8.244E+01	6.542E-05	-8.788E+00
5.599E-08	1.374E+03	1.430E-06	-9.711E+01	6.703E-05	-8.403E+00
5.702E-08	1.387E+03	1.461E-06	-1.096E+02	6.865E-05	-7.764E+00
5.804E-08	1.413E+03	1.493E-06	-1.204E+02	7.035E-05	-7.386E+00
5.918E-08	1.496E+03	1.526E-06	-1.292E+02	7.205E-05	-7.100E+00
6.031E-08	1.561E+03	1.567E-06	-1.378E+02	7.383E-05	-6.771E+00
6.155E-08	1.518E+03	1.608E-06	-1.438E+02	7.562E-05	-6.539E+00
6.280E-08	1.474E+03	1.641E-06	-1.469E+02	7.748E-05	-6.558E+00
6.417E-08	1.562E+03	1.673E-06	-1.487E+02	7.933E-05	-6.533E+00
6.555E-08	1.689E+03	1.715E-06	-1.493E+02	8.128E-05	-6.084E+00
6.706E-08	1.777E+03	1.756E-06	-1.485E+02	8.322E-05	-5.613E+00
6.858E-08	1.839E+03	1.797E-06	-1.470E+02	8.527E-05	-5.519E+00
7.025E-08	1.882E+03	1.838E-06	-1.450E+02	8.731E-05	-5.519E+00
7.192E-08	1.927E+03	1.880E-06	-1.427E+02	8.945E-05	-5.341E+00
7.282E-08	1.966E+03	1.921E-06	-1.403E+02	9.158E-05	-5.141E+00
7.372E-08	2.008E+03	1.970E-06	-1.373E+02	9.382E-05	-5.045E+00
7.565E-08	2.087E+03	2.020E-06	-1.348E+02	9.606E-05	-4.949E+00
7.759E-08	2.153E+03	2.061E-06	-1.333E+02	9.840E-05	-4.748E+00
7.863E-08	2.179E+03	2.102E-06	-1.324E+02	1.007E-04	-4.508E+00
7.967E-08	2.205E+03	2.152E-06	-1.320E+02	1.032E-04	-4.242E+00
8.190E-08	2.284E+03	2.201E-06	-1.322E+02	1.057E-04	-4.094E+00
8.414E-08	2.359E+03	2.259E-06	-1.328E+02	1.082E-04	-4.263E+00
8.529E-08	2.384E+03	2.317E-06	-1.337E+02	1.108E-04	-4.479E+00
8.644E-08	2.400E+03	2.366E-06	-1.349E+02	1.163E-04	-4.139E+00
8.874E-08	2.393E+03	2.474E-06	-1.361E+02	1.218E-04	-3.623E+00
9.104E-08	2.395E+03	2.531E-06	-1.372E+02	1.247E-04	-3.617E+00
9.219E-08	2.422E+03	2.589E-06	-1.378E+02	1.277E-04	-3.594E+00
9.334E-08	2.458E+03		-1.375E+02	1.308E-04	-3.347E+00

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

9.564E-08	2.550E+03	2.647E-06	-1.366E+02	1.339E-04	-3.071E+00
9.794E-08	2.623E+03	2.713E-06	-1.350E+02	1.371E-04	-2.977E+00
1.002E-07	2.622E+03	2.779E-06	-1.331E+02	1.403E-04	-2.922E+00
1.025E-07	2.604E+03	2.845E-06	-1.312E+02	1.437E-04	-2.768E+00
1.048E-07	2.623E+03	2.911E-06	-1.295E+02	1.472E-04	-2.587E+00
1.071E-07	2.653E+03	2.977E-06	-1.286E+02	1.507E-04	-2.411E+00
1.094E-07	2.682E+03	3.043E-06	-1.289E+02	1.542E-04	-2.265E+00
1.117E-07	2.704E+03	3.117E-06	-1.314E+02	1.579E-04	-2.182E+00
1.140E-07	2.705E+03	3.192E-06	-1.360E+02	1.616E-04	-2.116E+00
1.163E-07	2.702E+03	3.266E-06	-1.428E+02	1.655E-04	-2.004E+00
1.188E-07	2.713E+03	3.340E-06	-1.512E+02	1.695E-04	-1.884E+00
1.212E-07	2.732E+03	3.414E-06	-1.606E+02	1.735E-04	-1.776E+00
1.231E-07	2.755E+03	3.489E-06	-1.708E+02	1.776E-04	-1.672E+00
1.263E-07	2.775E+03	3.571E-06	-1.816E+02	1.818E-04	-1.554E+00
1.315E-07	2.786E+03	3.654E-06	-1.916E+02	1.861E-04	-1.452E+00
1.344E-07	2.765E+03	3.736E-06	-1.998E+02	1.906E-04	-1.400E+00
1.372E-07	2.751E+03	3.819E-06	-2.059E+02	1.950E-04	-1.357E+00
1.401E-07	2.747E+03	3.509E-06	-2.099E+02	1.997E-04	-1.274E+00
1.430E-07	2.749E+03	4.000E-06	-2.116E+02	2.044E-04	-1.182E+00
1.460E-07	2.754E+03	4.099E-06	-2.118E+02	2.093E-04	-1.098E+00
1.491E-07	2.759E+03	4.198E-06	-2.104E+02	2.141E-04	-1.018E+00
1.523E-07	2.756E+03	4.297E-06	-2.077E+02	2.193E-04	-9.277E-01
1.555E-07	2.748E+03	4.396E-06	-2.025E+02	2.244E-04	-8.523E-01
1.589E-07	2.737E+03	4.495E-06	-1.940E+02	2.298E-04	-8.154E-01
1.622E-07	2.724E+03	4.594E-06	-1.811E+02	2.351E-04	-7.839E-01
1.657E-07	2.707E+03	4.702E-06	-1.610E+02	2.408E-04	-7.183E-01
1.692E-07	2.690E+03	4.809E-06	-1.340E+02	2.464E-04	-6.434E-01
1.729E-07	2.672E+03	4.924E-06	-9.314E+01	2.523E-04	-5.742E-01
1.766E-07	2.655E+03	5.040E-06	-5.880E+01	2.561E-04	-5.092E-01
1.805E-07	2.638E+03	5.156E-06	-4.953E+01	2.643E-04	-4.446E-01
1.843E-07	2.620E+03	5.272E-06	-5.934E+01	2.705E-04	-3.832E-01
1.884E-07	2.602E+03	5.485E-06	-1.289E+02	2.770E-04	-3.184E-01
1.924E-07	2.583E+03	5.698E-06	-2.008E+02	2.834E-04	-2.671E-01
1.987E-07	2.552E+03	5.906E-06	-2.028E+02	2.902E-04	-2.478E-01
2.050E-07	2.518E+03	6.115E-06	-1.968E+02	2.969E-04	-2.313E-01
2.094E-07	2.493E+03	6.340E-06	-2.445E+02	3.040E-04	-1.836E-01
2.128E-07	2.468E+03	6.566E-06	-2.892E+02	3.111E-04	-1.254E-01
2.185E-07	2.442E+03	6.809E-06	-2.733E+02	4.055E-04	-9.985E-04
2.231E-07	2.416E+03	7.052E-06	-2.407E+02	5.000E-04	-8.864E-06

NUMBER OF POINTS = 445

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

FOURIER TRANSFORM CALCULATIONS

STARTING FREQUENCY(HERTZ)= 1.000E+04   DELTA FREQUENCY= 1.020E+00
MAXIMUM FREQUENCY TO BE CALCULATED= 6.000E+07

FREQUENCY(HZ)	REAL	AMPLITUDE(V/M/HZ) IMAGINARY		FREQUENCY(HZ)	REAL	AMPLITUDE(V/M/HZ) IMAGINARY
1.000E+04	-2.061E-05	1.323E-03		7.898E+05	2.799E-05	-5.743E-04
1.020E+04	1.234E-06	1.324E-03		8.054E+05	2.480E-05	-5.786E-04
1.040E+04	2.299E-05	1.325E-03		8.213E+05	1.145E-05	-5.810E-04
1.061E+04	4.469E-05	1.326E-03		8.376E+05	-8.696E-06	-5.764E-04
1.082E+04	6.638E-05	1.327E-03		8.541E+05	-3.056E-05	-5.619E-04
1.103E+04	8.811E-05	1.327E-03		8.710E+05	-4.874E-05	-5.373E-04
1.125E+04	1.099E-04	1.327E-03		8.883E+05	-5.676E-05	-5.047E-04
1.147E+04	1.317E-04	1.327E-03		9.058E+05	-4.939E-05	-4.716E-04
1.170E+04	1.535E-04	1.327E-03		9.238E+05	-2.741E-05	-4.492E-04
1.193E+04	1.753E-04	1.326E-03		9.420E+05	-7.296E-07	-4.457E-04
1.216E+04	1.970E-04	1.325E-03		9.607E+05	1.639E-05	-4.606E-04
1.241E+04	2.185E-04	1.324E-03		9.797E+05	1.465E-05	-4.842E-04
1.265E+04	2.398E-04	1.323E-03		9.991E+05	-6.733E-06	-5.010E-04
1.290E+04	2.610E-04	1.321E-03		1.019E+06	-3.898E-05	-5.013E-04
1.316E+04	2.821E-04	1.320E-03		1.039E+06	-6.861E-05	-4.827E-04
1.344E+04	3.031E-04	1.319E-03		1.060E+06	-8.449E-05	-4.510E-04
1.368E+04	3.242E-04	1.317E-03		1.081E+06	-8.157E-05	-4.186E-04
1.395E+04	3.454E-04	1.316E-03		1.102E+06	-6.402E-05	-3.993E-04
1.423E+04	3.667E-04	1.314E-03		1.124E+06	-4.558E-05	-3.991E-04
1.451E+04	3.880E-04	1.312E-03		1.146E+06	-4.152E-05	-4.119E-04
1.480E+04	4.093E-04	1.311E-03		1.169E+06	-5.484E-05	-4.226E-04
1.509E+04	4.308E-04	1.309E-03		1.192E+06	-7.688E-05	-4.192E-04
1.539E+04	4.523E-04	1.307E-03		1.215E+06	-9.416E-05	-4.017E-04
1.569E+04	4.740E-04	1.306E-03		1.239E+06	-9.874E-05	-3.796E-04
1.600E+04	4.962E-04	1.304E-03		1.264E+06	-9.305E-05	-3.639E-04
1.632E+04	5.188E-04	1.302E-03		1.289E+06	-8.653E-05	-3.585E-04
1.664E+04	5.420E-04	1.300E-03		1.314E+06	-8.673E-05	-3.588E-04
1.697E+04	5.656E-04	1.297E-03		1.340E+06	-9.413E-05	-3.572E-04
1.731E+04	5.896E-04	1.294E-03		1.367E+06	-1.034E-04	-3.499E-04
1.765E+04	6.137E-04	1.290E-03		1.394E+06	-1.095E-04	-3.386E-04
1.800E+04	6.379E-04	1.285E-03		1.422E+06	-1.114E-04	-3.278E-04
1.836E+04	6.619E-04	1.280E-03		1.450E+06	-1.122E-04	-3.199E-04
1.872E+04	6.856E-04	1.273E-03		1.478E+06	-1.142E-04	-3.137E-04
1.909E+04	7.089E-04	1.267E-03		1.508E+06	-1.177E-04	-3.070E-04
1.947E+04	7.319E-04	1.260E-03		1.537E+06	-1.215E-04	-2.991E-04
1.985E+04	7.546E-04	1.253E-03		1.568E+06	-1.239E-04	-2.907E-04
2.025E+04	7.774E-04	1.246E-03		1.599E+06	-1.257E-04	-2.834E-04
2.065E+04	8.002E-04	1.238E-03		1.631E+06	-1.281E-04	-2.768E-04
2.105E+04	8.229E-04	1.230E-03		1.663E+06	-1.315E-04	-2.699E-04
2.147E+04	8.455E-04	1.221E-03		1.696E+06	-1.348E-04	-2.613E-04
2.190E+04	8.673E-04	1.211E-03		1.729E+06	-1.363E-04	-2.523E-04
2.233E+04	8.882E-04	1.202E-03		1.763E+06	-1.365E-04	-2.446E-04
2.277E+04	9.082E-04	1.192E-03		1.798E+06	-1.375E-04	-2.393E-04
2.322E+04	9.278E-04	1.183E-03		1.834E+06	-1.409E-04	-2.327E-04
2.368E+04	9.475E-04	1.175E-03		1.870E+06	-1.438E-04	-2.250E-04
2.415E+04	9.676E-04	1.167E-03		1.907E+06	-1.456E-04	-2.151E-04
2.463E+04	9.883E-04	1.158E-03		1.945E+06	-1.440E-04	-2.075E-04

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

2.511E+04	1.009E-03	1.150E-03	1.983E+06	-1.451E-04	-2.018E-04
2.561E+04	1.030E-03	1.141E-03	2.023E+06	-1.464E-04	-1.963E-04
2.612E+04	1.051E-03	1.132E-03	2.063E+06	-1.496E-04	-1.879E-04
2.663E+04	1.073E-03	1.122E-03	2.103E+06	-1.496E-04	-1.792E-04
2.716E+04	1.094E-03	1.112E-03	2.145E+06	-1.485E-04	-1.717E-04
2.770E+04	1.115E-03	1.101E-03	2.188E+06	-1.484E-04	-1.662E-04
2.825E+04	1.136E-03	1.090E-03	2.231E+06	-1.495E-04	-1.600E-04
2.881E+04	1.156E-03	1.079E-03	2.275E+06	-1.509E-04	-1.520E-04
2.938E+04	1.176E-03	1.068E-03	2.320E+06	-1.494E-04	-1.439E-04
2.996E+04	1.197E-03	1.057E-03	2.366E+06	-1.486E-04	-1.383E-04
3.055E+04	1.218E-03	1.045E-03	2.413E+06	-1.483E-04	-1.322E-04
3.115E+04	1.239E-03	1.033E-03	2.460E+06	-1.490E-04	-1.248E-04
3.177E+04	1.261E-03	1.020E-03	2.509E+06	-1.469E-04	-1.177E-04
3.240E+04	1.280E-03	1.006E-03	2.559E+06	-1.458E-04	-1.119E-04
3.304E+04	1.300E-03	9.925E-04	2.609E+06	-1.454E-04	-1.062E-04
3.369E+04	1.319E-03	9.800E-04	2.661E+06	-1.437E-04	-9.883E-05
3.436E+04	1.340E-03	9.673E-04	2.714E+06	-1.424E-04	-9.392E-05
3.504E+04	1.361E-03	9.536E-04	2.767E+06	-1.413E-04	-8.686E-05
3.573E+04	1.383E-03	9.389E-04	2.822E+06	-1.387E-04	-8.163E-05
3.644E+04	1.404E-03	9.232E-04	2.878E+06	-1.375E-04	-7.634E-05
3.716E+04	1.426E-03	9.065E-04	2.935E+06	-1.354E-04	-6.989E-05
3.790E+04	1.447E-03	8.884E-04	2.993E+06	-1.330E-04	-6.569E-05
3.865E+04	1.467E-03	8.687E-04	3.052E+06	-1.317E-04	-5.928E-05
3.941E+04	1.486E-03	8.483E-04	3.113E+06	-1.278E-04	-5.537E-05
4.019E+04	1.503E-03	8.281E-04	3.174E+06	-1.281E-04	-5.050E-05
4.099E+04	1.519E-03	8.088E-04	3.237E+06	-1.226E-04	-4.364E-05
4.180E+04	1.535E-03	7.897E-04	3.301E+06	-1.212E-04	-4.325E-05
4.262E+04	1.551E-03	7.708E-04	3.366E+06	-1.200E-04	-3.398E-05
4.347E+04	1.567E-03	7.521E-04	3.433E+06	-1.141E-04	-3.325E-05
4.433E+04	1.584E-03	7.328E-04	3.501E+06	-1.152E-04	-2.901E-05
4.521E+04	1.601E-03	7.125E-04	3.570E+06	-1.092E-04	-2.278E-05
4.610E+04	1.617E-03	6.917E-04	3.641E+06	-1.079E-04	-2.234E-05
4.701E+04	1.633E-03	6.703E-04	3.713E+06	-1.052E-04	-1.588E-05
4.794E+04	1.648E-03	6.480E-04	3.786E+06	-1.008E-04	-1.451E-05
4.889E+04	1.663E-03	6.247E-04	3.861E+06	-9.940E-05	-1.045E-05
4.986E+04	1.676E-03	6.015E-04	3.938E+06	-9.520E-05	-7.496E-06
5.084E+04	1.688E-03	5.791E-04	4.015E+06	-9.307E-05	-4.920E-06
5.185E+04	1.701E-03	5.570E-04	4.095E+06	-8.985E-05	-1.931E-06
5.288E+04	1.713E-03	5.351E-04	4.176E+06	-8.660E-05	3.074E-07
5.392E+04	1.726E-03	5.130E-04	4.259E+06	-8.409E-05	3.212E-06
5.499E+04	1.740E-03	4.904E-04	4.343E+06	-8.049E-05	4.828E-06
5.608E+04	1.755E-03	4.663E-04	4.429E+06	-7.189E-05	7.553E-06
5.719E+04	1.770E-03	4.394E-04	4.516E+06	-7.449E-05	9.003E-06
5.832E+04	1.782E-03	4.100E-04	4.606E+06	-7.189E-05	1.117E-05
5.947E+04	1.791E-03	3.803E-04	4.697E+06	-6.906E-05	1.229E-05
6.065E+04	1.798E-03	3.524E-04	4.790E+06	-6.568E-05	1.426E-05
6.185E+04	1.806E-03	3.266E-04	4.885E+06	-6.356E-05	1.588E-05
6.307E+04	1.815E-03	3.005E-04	4.981E+06	-6.009E-05	1.646E-05
6.432E+04	1.826E-03	2.720E-04	5.080E+06	-5.719E-05	1.837E-05
6.559E+04	1.836E-03	2.399E-04	5.180E+06	-5.491E-05	1.902E-05
6.689E+04	1.843E-03	2.054E-04	5.283E+06	-5.222E-05	1.974E-05
6.821E+04	1.845E-03	1.708E-04	5.387E+06	-4.893E-05	2.042E-05
6.956E+04	1.846E-03	1.380E-04	5.494E+06	-4.677E-05	2.209E-05
7.094E+04	1.845E-03	1.067E-04	5.603E+06	-4.476E-05	2.153E-05
7.234E+04	1.845E-03	7.535E-05	5.713E+06	-4.105E-05	2.226E-05
7.378E+04	1.845E-03	4.251E-05	5.826E+06	-3.949E-05	2.334E-05
7.524E+04	1.842E-03	8.186E-06	5.942E+06	-3.723E-05	2.276E-05
7.672E+04	1.836E-03	-2.565E-05	6.059E+06	-3.423E-05	2.308E-05
7.824E+04	1.828E-03	-5.770E-05	6.179E+06	-3.235E-05	2.371E-05
7.979E+04	1.818E-03	-8.820E-05	6.301E+06	-3.052E-05	2.339E-05

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

8.137E+04	1.808E-03	-1.181E-04	6.426E+06	-2.816E-05	2.309E-05
8.298E+04	1.796E-03	-1.468E-04	6.553E+06	-2.594E-05	2.338E-05
8.462E+04	1.783E-03	-1.729E-04	6.683E+06	-2.432E-05	2.311E-05
8.629E+04	1.770E-03	-1.955E-04	6.815E+06	-2.239E-05	2.255E-05
8.800E+04	1.761E-03	-2.166E-04	6.950E+06	-2.022E-05	2.250E-05
8.974E+04	1.756E-03	-2.391E-04	7.087E+06	-1.873E-05	2.226E-05
9.152E+04	1.752E-03	-2.657E-04	7.228E+06	-1.702E-05	2.158E-05
9.333E+04	1.749E-03	-2.982E-04	7.371E+06	-1.521E-05	2.120E-05
9.518E+04	1.741E-03	-3.373E-04	7.517E+06	-1.387E-05	2.093E-05
9.706E+04	1.724E-03	-3.805E-04	7.665E+06	-1.265E-05	2.022E-05
9.898E+04	1.697E-03	-4.214E-04	7.817E+06	-1.111E-05	1.942E-05
1.009E+05	1.662E-03	-4.553E-04	7.972E+06	-9.620E-06	1.900E-05
1.029E+05	1.626E-03	-4.819E-04	8.129E+06	-8.492E-06	1.866E-05
1.050E+05	1.588E-03	-5.026E-04	8.290E+06	-7.702E-06	1.797E-05
1.070E+05	1.550E-03	-5.180E-04	8.454E+06	-6.897E-06	1.704E-05
1.092E+05	1.514E-03	-5.283E-04	8.621E+06	-5.889E-06	1.605E-05
1.113E+05	1.480E-03	-5.356E-04	8.792E+06	-4.903E-06	1.518E-05
1.135E+05	1.447E-03	-5.416E-04	8.966E+06	-4.094E-06	1.440E-05
1.158E+05	1.414E-03	-5.452E-04	9.143E+06	-3.362E-06	1.374E-05
1.181E+05	1.382E-03	-5.455E-04	9.324E+06	-2.510E-06	1.306E-05
1.204E+05	1.350E-03	-5.424E-04	9.509E+06	-1.822E-06	1.214E-05
1.228E+05	1.320E-03	-5.357E-04	9.697E+06	-1.385E-06	1.137E-05
1.252E+05	1.291E-03	-5.244E-04	9.889E+06	-9.727E-07	1.081E-05
1.277E+05	1.266E-03	-5.099E-04	1.008E+07	-5.325E-07	1.018E-05
1.302E+05	1.248E-03	-4.949E-04	1.028E+07	-2.066E-07	9.392E-06
1.328E+05	1.230E-03	-4.788E-04	1.049E+07	-1.198E-07	8.582E-06
1.354E+05	1.208E-03	-4.584E-04	1.069E+07	-1.387E-C7	8.043E-06
1.381E+05	1.208E-03	-4.353E-04	1.091E+07	-1.356E-07	7.571E-06
1.408E+05	1.219E-03	-4.145E-04	1.112E+07	-2.950E-07	6.936E-06
1.436E+05	1.232E-03	-3.971E-04	1.134E+07	-4.327E-07	6.360E-06
1.465E+05	1.250E-03	-3.814E-04	1.157E+07	-2.617E-07	5.957E-06
1.494E+05	1.271E-03	-3.677E-04	1.180E+07	-4.186E-07	5.472E-06
1.523E+05	1.289E-03	-3.592E-04	1.203E+07	-2.453E-07	5.059E-06
1.553E+05	1.297E-03	-3.600E-04	1.227E+07	-3.233E-07	4.698E-06
1.584E+05	1.301E-03	-3.707E-04	1.251E+07	-2.370E-07	4.485E-06
1.615E+05	1.308E-03	-3.837E-04	1.276E+07	-2.804E-07	4.005E-06
1.647E+05	1.323E-03	-3.915E-04	1.301E+07	-3.737E-08	3.948E-06
1.680E+05	1.342E-03	-3.945E-04	1.327E+07	-5.077E-08	3.633E-06
1.713E+05	1.359E-03	-3.984E-04	1.353E+07	-1.725E-07	3.450E-06
1.747E+05	1.374E-03	-4.093E-04	1.380E+07	-1.257E-07	3.256E-06
1.782E+05	1.387E-03	-4.279E-04	1.407E+07	-2.155E-07	3.254E-06
1.817E+05	1.399E-03	-4.502E-04	1.435E+07	-3.911E-07	3.180E-06
1.853E+05	1.409E-03	-4.747E-04	1.463E+07	-4.756E-07	3.169E-06
1.889E+05	1.413E-03	-5.035E-04	1.492E+07	-5.671E-07	3.113E-06
1.927E+05	1.412E-03	-5.378E-04	1.522E+07	-5.561E-07	3.116E-06
1.965E+05	1.409E-03	-5.757E-04	1.552E+07	-4.984E-C7	3.252E-06
2.004E+05	1.400E-03	-6.143E-04	1.583E+07	-5.696E-07	3.446E-06
2.043E+05	1.384E-03	-6.554E-04	1.614E+07	-4.567E-07	3.433E-06
2.084E+05	1.359E-03	-7.002E-04	1.646E+07	-2.683E-07	3.623E-06
2.125E+05	1.328E-03	-7.470E-04	1.678E+07	-1.417E-07	3.709E-06
2.167E+05	1.289E-03	-7.928E-04	1.712E+07	-1.940E-07	3.745E-06
2.210E+05	1.241E-03	-8.365E-04	1.745E+07	-4.995E-C7	3.811E-06
2.254E+05	1.188E-03	-8.770E-04	1.780E+07	7.251E-07	3.838E-06
2.298E+05	1.134E-03	-9.109E-04	1.815E+07	1.043E-C6	3.780E-06
2.344E+05	1.081E-03	-9.359E-04	1.851E+07	1.334E-06	3.586E-06
2.390E+05	1.029E-03	-9.509E-04	1.888E+07	1.629E-06	3.379E-06
2.438E+05	9.803E-04	-9.568E-04	1.925E+07	1.937E-06	3.240E-06
2.486E+05	9.361E-04	-9.557E-04	1.963E+07	2.156E-C6	2.970E-06
2.535E+05		-9.462E-04	2.002E+07	2.374E-06	2.771E-06
2.585E+05		-9.289E-04	2.042E+07	2.594E-06	2.493E-06

66

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

2.636E+05	9.007E-04	-9.055E-04	2.082E+07	2.797E-06	2.135E-06
2.688E+05	8.741E-04	-8.808E-04	2.123E+07	2.948E-06	1.894E-06
2.742E+05	8.541E-04	-8.563E-04	2.165E+07	3.061E-06	1.539E-06
2.796E+05	8.405E-04	-8.320E-04	2.208E+07	3.160E-06	1.150E-06
2.851E+05	8.347E-04	-8.098E-04	2.252E+07	3.260E-06	8.049E-07
2.908E+05	8.343E-04	-7.926E-04	2.296E+07	3.300E-06	3.222E-07
2.965E+05	8.368E-04	-7.809E-04	2.342E+07	3.342E-06	-1.391E-07
3.024E+05	8.414E-04	-7.733E-04	2.388E+07	3.214E-06	-6.247E-07
3.084E+05	8.473E-04	-7.706E-04	2.435E+07	3.001E-06	-1.109E-06
3.145E+05	8.535E-04	-7.730E-04	2.483E+07	2.761E-06	-1.588E-06
3.207E+05	8.591E-04	-7.790E-04	2.533E+07	2.327E-06	-1.955E-06
3.270E+05	8.642E-04	-7.895E-04	2.583E+07	1.872E-06	-2.326E-06
3.335E+05	8.674E-04	-8.048E-04	2.634E+07	1.269E-06	-2.442E-06
3.401E+05	8.673E-04	-8.237E-04	2.686E+07	6.808E-07	-2.560E-06
3.468E+05	8.637E-04	-8.445E-04	2.739E+07	1.370E-07	-2.529E-06
3.537E+05	8.574E-04	-8.673E-04	2.793E+07	-2.956E-07	-2.297E-06
3.607E+05	8.487E-04	-8.927E-04	2.849E+07	-6.944E-07	-2.055E-06
3.678E+05	8.355E-04	-9.207E-04	2.905E+07	-9.575E-07	-1.780E-06
3.751E+05	8.173E-04	-9.509E-04	2.962E+07	-1.157E-06	-1.491E-06
3.825E+05	7.932E-04	-9.815E-04	3.021E+07	-1.326E-06	-1.209E-06
3.901E+05	7.622E-04	-1.012E-03	3.081E+07	-1.472E-06	-9.885E-07
3.978E+05	7.238E-04	-1.041E-03	3.142E+07	-1.650E-06	-7.550E-07
4.057E+05	6.778E-04	-1.065E-03	3.204E+07	-1.796E-06	-4.790E-07
4.137E+05	6.254E-04	-1.083E-03	3.267E+07	-1.970E-06	-1.434E-07
4.219E+05	5.682E-04	-1.092E-03	3.332E+07	-2.038E-06	8.433E-07
4.302E+05	5.082E-04	-1.089E-03	3.398E+07	-2.006E-06	1.422E-06
4.388E+05	4.507E-04	-1.075E-03	3.465E+07	-1.803E-06	1.895E-06
4.474E+05	4.000E-04	-1.050E-03	3.534E+07	-1.391E-06	2.250E-06
4.563E+05	3.574E-04	-1.019E-03	3.604E+07	-8.054E-07	2.360E-06
4.653E+05	3.255E-04	-9.846E-04	3.675E+07	-1.410E-07	2.201E-06
4.745E+05	3.029E-04	-9.514E-04	3.748E+07	5.241E-07	1.819E-06
4.839E+05	2.869E-04	-9.230E-04	3.822E+07	1.053E-06	1.317E-06
4.935E+05	2.733E-04	-8.979E-04	3.897E+07	1.383E-06	7.958E-07
5.033E+05	2.608E-04	-8.752E-04	3.974E+07	1.481E-06	3.888E-07
5.132E+05	2.511E-04	-8.526E-04	4.053E+07	1.343E-06	1.378E-07
5.234E+05	2.450E-04	-8.301E-04	4.133E+07	1.129E-06	5.707E-08
5.337E+05	2.448E-04	-8.118E-04	4.215E+07	8.979E-07	1.104E-07
5.443E+05	2.497E-04	-7.998E-04	4.298E+07	7.991E-07	1.336E-07
5.550E+05	2.536E-04	-7.986E-04	4.383E+07	8.617E-07	8.597E-08
5.660E+05	2.521E-04	-8.065E-04	4.470E+07	9.815E-07	-8.041E-08
5.772E+05	2.394E-04	-8.186E-04	4.559E+07	1.113E-06	-3.753E-07
5.887E+05	2.156E-04	-8.284E-04	4.649E+07	1.138E-06	-6.484E-07
6.003E+05	1.840E-04	-8.298E-04	4.741E+07	1.020E-06	-8.671E-07
6.122E+05	1.513E-04	-8.216E-04	4.835E+07	8.026E-07	-9.697E-07
6.243E+05	1.223E-04	-8.062E-04	4.930E+07	5.271E-07	-9.680E-07
6.366E+05	9.735E-05	-7.878E-04	5.026E+07	3.061E-07	-9.459E-07
6.492E+05	7.515E-05	-7.680E-04	5.127E+07	1.433E-07	-9.432E-07
6.621E+05	5.506E-05	-7.465E-04	5.229E+07	-1.828E-07	-9.745E-07
6.752E+05	3.769E-05	-7.220E-04	5.332E+07	-1.872E-07	-9.170E-07
6.885E+05	2.438E-05	-6.967E-04	5.436E+07	-4.739E-07	-7.111E-07
7.022E+05	1.609E-05	-6.716E-04	5.545E+07	-7.492E-07	-3.352E-07
7.161E+05	1.026E-05	-6.479E-04	5.655E+07	-8.973E-07	-5.582E-08
7.302E+05	9.986E-06	-6.254E-04	5.767E+07	-8.059E-07	2.947E-07
7.447E+05	7.982E-06	-6.038E-04	5.881E+07	-5.106E-07	2.439E-07
7.594E+05	1.375E-05	-5.855E-04	5.997E+07	-1.636E-07	
7.744E+05	2.236E-05	-5.755E-04			

NUMBER OF POINTS = 445

67

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

TIME DERIVATIVE CALCULATIONS

TIME (SEC)	DERIVATIVE OF E-RADIAL	TIME (SEC)	DERIVATIVE OF E-RADIAL	TIME (SEC)	DERIVATIVE OF E-RADIAL
8.304E-09	0.0	2.280E-07	-5.702E+09	7.294E-06	3.006E+06
9.342E-09	7.728E+08	2.330E-07	-5.654E+09	7.537E-06	4.385E+07
1.038E-08	1.104E+09	2.380E-07	-5.582E+09	7.798E-06	8.823E+07
1.153E-08	3.234E+09	2.431E-07	-5.516E+09	8.058E-06	9.690E+07
1.269E-08	6.655E+09	2.485E-07	-5.437E+09	8.318E-06	9.659E+07
1.375E-08	9.651E+09	2.538E-07	-5.345E+09	8.578E-06	7.745E+07
1.441E-08	1.332E+10	2.595E-07	-5.244E+09	8.856E-06	5.073E+07
1.543E-08	1.711E+10	2.651E-07	-5.158E+09	9.134E-06	4.674E+07
1.705E-08	2.060E+10	2.710E-07	-5.069E+09	9.429E-06	4.311E+07
1.827E-08	2.382E+10	2.769E-07	-4.968E+09	9.723E-06	3.002E+07
1.948E-08	2.600E+10	2.830E-07	-4.860E+09	1.004E-05	1.600E+07
2.070E-08	2.730E+10	2.891E-07	-4.751E+09	1.035E-05	-7.788E+06
2.191E-08	2.726E+10	2.956E-07	-4.636E+09	1.068E-05	-2.709E+07
2.298E-08	2.654E+10	3.022E-07	-4.528E+09	1.101E-05	-9.722E+06
2.406E-08	2.463E+10	3.089E-07	-4.418E+09	1.134E-05	1.149E+07
2.531E-08	2.208E+10	3.156E-07	-4.295E+09	1.167E-05	1.915E+07
2.656E-08	2.018E+10	3.227E-07	-4.170E+09	1.203E-05	2.325E+07
2.750E-08	1.911E+10	3.298E-07	-4.065E+09	1.240E-05	6.705E+06
2.843E-08	1.902E+10	3.370E-07	-3.961E+09	1.276E-05	-1.057E+07
2.943E-08	1.978E+10	3.442E-07	-3.848E+09	1.312E-05	-1.358E+06
3.043E-08	2.253E+10	3.518E-07	-3.734E+09	1.352E-05	1.010E+07
3.088E-08	2.378E+10	3.594E-07	-3.631E+09	1.392E-05	7.144E+05
3.133E-08	2.592E+10	3.670E-07	-3.533E+09	1.432E-05	-8.336E+06
3.174E-08	2.816E+10	3.745E-07	-3.442E+09	1.472E-05	-3.191E+06
3.214E-08	3.035E+10	3.866E-07	-3.306E+09	1.515E-05	3.891E+06
3.251E-08	3.253E+10	3.987E-07	-3.176E+09	1.559E-05	6.743E+06
3.287E-08	3.505E+10	4.069E-07	-3.092E+09	1.602E-05	9.107E+06
3.320E-08	3.753E+10	4.150E-07	-3.027E+09	1.646E-05	1.031E+07
3.353E-08	4.039E+10	4.233E-07	-2.966E+09	1.692E-05	1.047E+07
3.382E-08	4.315E+10	4.316E-07	-2.904E+09	1.739E-05	9.343E+06
3.412E-08	4.614E+10	4.404E-07	-2.844E+09	1.790E-05	7.412E+06
3.439E-08	4.895E+10	4.491E-07	-2.786E+09	1.840E-05	4.876E+06
3.465E-08	5.185E+10	4.621E-07	-2.710E+09	1.890E-05	2.415E+06
3.489E-08	5.452E+10	4.752E-07	-2.648E+09	1.940E-05	1.511E+06
3.513E-08	5.716E+10	4.839E-07	-2.610E+09	1.994E-05	9.889E+05
3.534E-08	5.955E+10	4.926E-07	-2.577E+09	2.048E-05	2.321E+05
3.556E-08	6.201E+10	5.066E-07	-2.531E+09	2.104E-05	-1.744E+05
3.575E-08	6.421E+10	5.205E-07	-2.485E+09	2.159E-05	2.027E+05
3.595E-08	6.637E+10	5.298E-07	-2.456E+09	2.218E-05	8.765E+05
3.612E-08	6.824E+10	5.392E-07	-2.431E+09	2.277E-05	1.734E+06
3.630E-08	6.988E+10	5.534E-07	-2.397E+09	2.340E-05	2.587E+06
3.645E-08	7.125E+10	5.677E-07	-2.369E+09	2.402E-05	2.728E+06
3.661E-08	7.247E+10	5.777E-07	-2.350E+09	2.466E-05	2.667E+06
3.675E-08	7.346E+10	5.877E-07	-2.330E+09	2.530E-05	2.733E+06
3.689E-08	7.433E+10	6.028E-07	-2.300E+09	2.598E-05	2.646E+06
3.702E-08	7.502E+10	6.178E-07	-2.271E+09	2.666E-05	1.775E+06
3.715E-08	7.560E+10	6.331E-07	-2.242E+09	2.737E-05	9.438E+05
3.726E-08	7.605E+10	6.484E-07	-2.219E+09	2.808E-05	1.414E+06
3.737E-08	7.648E+10	6.645E-07	-2.195E+09	2.881E-05	1.994E+06
3.748E-08	7.679E+10	6.807E-07	-2.167E+09	2.954E-05	2.258E+06
3.758E-08	7.703E+10	6.968E-07	-2.138E+09	3.032E-05	2.294E+06

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

3.768E-08	7.711E+10	7.129E-07	-2.110E+09	3.110E-05	1.271E+06
3.778E-08	7.711E+10	7.293E-07	-2.081E+09	3.191E-05	9.877E+04
3.798E-08	7.671E+10	7.457E-07	-2.055E+09	3.273E-05	-9.181E+05
3.818E-08	7.596E+10	7.630E-07	-2.027E+09	3.358E-05	-1.581E+06
3.858E-08	7.506E+10	7.803E-07	-2.001E+09	3.443E-05	-3.462E+05
3.878E-08	7.407E+10	7.976E-07	-1.973E+09	3.532E-05	1.173E+06
3.898E-08	7.302E+10	8.149E-07	-1.937E+09	3.620E-05	1.768E+06
3.918E-08	7.208E+10	8.325E-07	-1.901E+09	3.714E-05	2.121E+06
3.938E-08	7.113E+10	8.501E-07	-1.872E+09	3.807E-05	1.719E+06
3.968E-08	7.023E+10	8.687E-07	-1.842E+09	3.905E-05	1.101E+06
3.998E-08	6.713E+10	8.872E-07	-1.807E+09	4.002E-05	6.920E+05
4.019E-08	6.713E+10	9.058E-07	-1.771E+09	4.104E-05	3.088E+05
4.039E-08	6.586E+10	9.244E-07	-1.730E+09	4.206E-05	4.089E+05
4.114E-08	6.475E+10	9.494E-07	-1.672E+09	4.314E-05	5.629E+05
4.189E-08	5.955E+10	9.544E-07	-1.618E+09	4.422E-05	-5.310E+04
4.253E-08	5.113E+10	1.016E-06	-1.574E+09	4.534E-05	-5.737E+05
4.316E-08	4.46E+10	1.041E-06	-1.530E+09	4.647E-05	2.130E+05
4.416E-08	3.930E+10	1.067E-06	-1.486E+09	4.763E-05	1.064E+06
4.515E-08	3.228E+10	1.094E-06	-1.397E+09	4.880E-05	1.156E+06
4.587E-08	3.041E+10	1.121E-06	-1.323E+09	5.003E-05	1.045E+06
4.659E-08	2.914E+10	1.142E-06	-1.252E+09	5.126E-05	2.237E+05
4.743E-08	2.749E+10	1.164E-06	-1.196E+09	5.254E-05	-6.078E+05
4.827E-08	2.584E+10	1.192E-06	-1.141E+09	5.383E-05	-2.120E+05
4.924E-08	2.379E+10	1.221E-06	-1.067E+09	5.518E-05	3.328E+05
5.020E-08	2.157E+10	1.249E-06	-9.881E+08	5.653E-05	1.834E+05
5.132E-08	1.963E+10	1.278E-06	-9.089E+08	5.796E-05	2.395E+05
5.245E-08	1.795E+10	1.300E-06	-8.253E+08	5.936E-05	4.418E+05
5.329E-08	1.644E+10	1.339E-06	-7.381E+08	6.085E-05	8.029E+05
5.413E-08	1.582E+10	1.369E-06	-6.634E+08	6.233E-05	1.622E+05
5.506E-08	1.369E+10	1.400E-06	-5.913E+08	6.387E-05	-4.632E+05
5.599E-08	2.043E+10	1.430E-06	-5.165E+08	6.542E-05	-6.534E+04
5.702E-08	2.620E+10	1.461E-06	-4.443E+08	6.703E-05	4.132E+05
5.804E-08	1.864E+10	1.493E-06	-3.709E+08	6.865E-05	3.154E+05
5.918E-08	1.166E+10	1.526E-06	-2.986E+08	7.035E-05	1.698E+05
6.031E-08	4.870E+10	1.567E-06	-2.408E+08	7.205E-05	1.783E+05
6.155E-08	8.313E+10	1.608E-06	-1.775E+08	7.383E-05	1.764E+05
6.280E-08	1.319E+10	1.641E-06	-1.179E+08	7.562E-05	5.814E+04
6.417E-08	-5.905E+10	1.672E-06	-7.517E+07	7.748E-05	-4.248E+04
6.555E-08	1.134E+10	1.715E-06	-3.476E+07	7.933E-05	1.200E+05
6.706E-08	7.519E+10	1.756E-06	5.704E+06	8.128E-05	2.881E+05
6.858E-08	7.73E+10	1.797E-06	2.833E+07	8.322E-05	1.484E+05
7.025E-08	4.665E+10	1.838E-06	4.273E+07	8.527E-05	-1.264E+04
7.192E-08	3.3R1E+10	1.880E-06	5.334E+07	8.731E-05	3.971E+04
7.282E-08	2.170E+10	1.921E-06	5.803E+07	8.945E-05	1.059E+05
7.372E-08	3.797E+10	1.970E-06	6.049E+07	9.158E-05	6.796E+04
7.565E-08	4.684E+10	2.020E-06	5.725E+07	9.382E-05	3.115E+04
7.759E-08	4.544E+10	2.061E-06	4.290E+07	9.606E-05	6.463E+04
7.967E-08	3.768E+10	2.102E-06	2.903E+07	9.840E-05	9.830E+04
8.190E-08	2.867E+10	2.152E-06	1.580E+07	1.007E-04	1.069E+05
8.414E-08	2.831E+10	2.201E-06	1.180E+06	1.032E-04	1.006E+05
8.549E-08	3.853E+10	2.259E-06	-7.058E+06	1.057E-04	-2.370E+03
8.644E-08	2.462E+10	2.317E-06	-1.358E+07	1.082E-04	-1.010E+05
8.874E-08	1.857E+10	2.366E-06	-2.067E+07	1.108E-04	-4.323E+04
9.104E-08	7.255E+09	2.416E-06	-2.409E+07	1.163E-04	1.187E+05
9.219E-08	-8.123E+09	2.474E-06	-2.234E+07	1.218E-04	3.250E+04
9.334E-08	1.698E+10	2.531E-06	-1.614E+07	1.247E-04	-1.231E+04
9.564E-08	2.846E+10	2.589E-06	-2.619E+06	1.277E-04	4.445E+04
9.734E-08	3.582E+10	2.647E-06	1.147E+07	1.300E-04	1.010E+05
	4.125E+10	2.713E-06	2.020E+07	1.339E-04	5.964E+04
	1.580E+10		2.679E+07	1.371E-04	1.220E+04

APPENDIX A

LISTING OF EMPFIT AND SAMPLE RUN (cont'd)

1.002E-07	-1.001E+10	2.779E-06	2.976E+07	1.403E-04	3.051E+04
1.025E-07	-1.725E+08	2.845E-06	2.791E+07	1.437E-04	5.299E+04
1.048E-07	1.257E+10	2.911E-06	1.982E+07	1.472E-04	5.171E+04
1.071E-07	1.305E+10	2.977E-06	6.181E+06	1.507E-04	4.745E+04
1.094E-07	1.229E+10	3.043E-06	-1.729E+07	1.542E-04	3.211E+04
1.117E-07	4.859E+09	3.117E-06	-4.713E+07	1.579E-04	1.652E+04
1.140E-07	-2.331E+09	3.192E-06	-7.698E+07	1.616E-04	2.281E+04
1.163E-07	1.455E+09	3.266E-06	-1.040E+08	1.655E-04	3.162E+04
1.188E-07	6.640E+09	3.340E-06	-1.215E+08	1.695E-04	2.875E+04
1.212E-07	8.509E+09	3.414E-06	-1.321E+08	1.735E-04	2.515E+04
1.237E-07	9.353E+09	3.489E-06	-1.351E+08	1.776E-04	2.681E+04
1.263E-07	6.182E+09	3.571E-06	-1.293E+08	1.818E-04	2.754E+04
1.289E-07	1.933E+09	3.654E-06	-1.112E+08	1.861E-04	1.776E+04
1.315E-07	-3.037E+09	3.736E-06	-8.775E+07	1.906E-04	8.286E+03
1.344E-07	-7.179E+09	3.819E-06	-5.972E+07	1.950E-04	1.343E+04
1.372E-07	-4.159E+09	3.909E-06	-2.917E+07	1.997E-04	2.003E+04
1.401E-07	-4.563E+07	4.000E-06	-1.090E+07	2.044E-04	1.854E+04
1.430E-07	1.311E+09	4.099E-06	6.731E+06	2.093E-04	1.632E+04
1.460E-07	2.073E+09	4.198E-06	2.051E+07	2.141E-04	1.707E+04
1.491E-07	4.227E+08	4.297E-06	3.768E+07	2.193E-04	1.715E+04
1.523E-07	-1.857E+09	4.396E-06	6.801E+07	2.244E-04	1.076E+04
1.555E-07	-2.819E+09	4.495E-06	1.056E+08	2.298E-04	4.738E+03
1.589E-07	-4.389E+09	4.594E-06	1.594E+08	2.351E-04	8.602E+03
1.622E-07	-4.884E+09	4.702E-06	2.124E+08	2.408E-04	1.346E+04
1.657E-07	-4.874E+09	4.809E-06	3.080E+08	2.464E-04	1.262E+04
1.692E-07	-4.691E+09	4.924E-06	3.637E+08	2.523E-04	1.126E+04
1.729E-07	-4.604E+09	5.040E-06	1.964E+08	2.581E-04	1.082E+04
1.766E-07	-4.512E+09	5.156E-06	-4.341E+06	2.643E-04	1.010E+04
1.805E-07	-4.510E+09	5.272E-06	-1.869E+08	2.705E-04	1.001E+04
1.843E-07	-4.575E+09	5.485E-06	-4.101E+08	2.770E-04	9.617E+03
1.884E-07	-4.806E+09	5.698E-06	-1.768E+08	2.834E-04	5.377E+03
1.924E-07	-5.224E+09	5.906E-06	8.041E+07	2.902E-04	1.473E+03
1.987E-07	-5.456E+09	6.115E-06	-8.735E+07	2.969E-04	4.639E+03
2.050E-07	-5.597E+09	6.340E-06	-2.674E+08	3.040E-04	7.729E+03
2.094E-07	-5.639E+09	6.566E-06	-7.168E+07	3.111E-04	6.925E+03
2.138E-07	-5.641E+09	6.809E-06	1.469E+08	4.055E-04	4.998E+01
2.185E-07	-5.683E+09	7.052E-06	8.310E+07	5.000E-04	4.432E-01
2.231E-07					

NUMBER OF POINTS = 445

70

APPENDIX B.--SAMPLE INPUT DATA

Figures B-1 to B-3 show examples of input card decks of EMPFIT.

```
●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●
        1           2           3           4           5           6           7           8
●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●


        1
        1                                   3-5.000E+05              1                       1
NEMP    PROBLEM A    OBSERVER 1
                1 5.000E-04 1.200E+08 5.000E+04 1.000E+04 6.000E+07             1
3.000E-04
        1           1
        2       146         204
```

Figure B-1. Example of data preparation by using disk file to enter data
points, using time cutoff option, deleting data points.

```
✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿
        1           2           3           4           5           6           7           8
✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿✿


        1
        3                                   3-5.000E+05              2                       1
NEMP    PROBLEM A    OBSERVER 1
                1 2.000E+00 1.200E+08 5.000E+00 1.000E+00 1.000E+10
        3       1           1
        2       146
        2 3.043E-06-1.289E+02 9.058E-06-1.866E+02
```

Figure B-2. Example of data preparation by using disk file to enter data
points, deleting data points, adding data points.

APPENDIX B

```
**********************************************************************************
        1           2           3           4           5           6           7           8
**********************************************************************************


        1
        3                                                  3-1.000E+05                                    2
LEMP    PROBLEM 2
        42              4 1.000E-01 1.200E+08 5.000E+05 1.000E+00 3.000E+09
        2                            1
1.424E-07-4.389E-05
1.563E-07-1.088E-04
1.718E-07-2.948E-04
1.886E-07-8.535E-04
2.072E-07-2.522E-03
2.498E-07-1.322E-02
2.745E-07-2.469E-02
3.021E-07-5.096E-02
3.653E-07-4.974E-01
4.003E-07-5.838E-01
4.380E-07-6.015E-01
4.793E-07-5.843E-01
5.259E-07-5.215E-01
8.368E-07-3.596E-01
9.178E-07-3.372E-01
1.104E-06-3.185E-01
1.326E-06-3.054E-01
1.595E-06-2.884E-01
2.103E-06-2.789E-01
2.529E-06-2.753E-01
3.041E-06-2.641E-01
4.399E-06-1.978E-01
5.287E-06-1.459E-01
6.358E-06-9.011E-02
8.377E-06-2.672E-02
1.007E-05-8.379E-03
1.105E-05-4.926E-03
1.211E-05-3.658E-03
1.328E-05-3.954E-03
1.456E-05-5.381E-03
1.919E-05-1.054E-02
2.307E-05-1.324E-02
2.773E-05-1.464E-02
3.334E-05-1.533E-02
3.656E-05-1.546E-02
4.009E-05-1.531E-02
4.300E-05-1.546E-02
5.284E-05-1.619E-02
6.353E-05-1.480E-02
7.638E-05-1.396E-02
8.080E-05-1.367E-02
8.374E-05-1.337E-02
```

Figure B-3. Example of data preparation by using cards to enter data points.

74

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